

EXHIBIT L

1 UNITED STATES DISTRICT COURT
2 WESTERN DISTRICT OF NEW YORK
3 Civ. No. 1:21-cv-00704-JLS

-----X

4 CAROL S. MARCELLIN,
5 Individually, and as
6 CoAdministrator of the
7 Estate of Charles E.
8 Hollowell, deceased, and
9 JESSICA HOLLOWELL-McKAY, as
10 Co-Administrator of the
11 Estate of Charles E.
12 Hollowell, Deceased,

13 Plaintiffs,

14 -against-

15 HP, INC., and STAPLES,
16 INC.,
17 Defendants.

-----X

18 DATE: April 3, 2025

19 TIME: 10:06 a.m.

20 EXAMINATION BEFORE TRIAL of the
21 Expert, QUINN HORN, taken by the Plaintiff,
22 pursuant to a Court Order, held via Zoom,
23 before a Notary Public of the State of New
24 York.

25 JOB NO. 7232381
PRIORITY-ONE COURT REPORTING SERVICES, INC.
290 West Mt. Pleasant Avenue
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A P P E A R A N C E S:

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BY: JACLYN WANEMAKER, ESQ.

Attorney for the Defendant, HP, Inc.

ALSO PRESENT:

Jessica McKay

Marcelo Rivera, Videographer

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S T I P U L A T I O N S

IT IS HEREBY STIPULATED AND AGREED
by and between the parties hereto, through
their respective counsel, that the
certification, sealing and filing of the
within examination will be and the same are
hereby waived;

IT IS HEREBY STIPULATED AND AGREED
that all objections, except as to the form of
question, will be reserved to the time of
trial;

IT IS HEREBY STIPULATED AND AGREED that
the within examination may be signed before
any Notary Public with the same force and
effect as if signed and sworn to before this
Court.

1 THE VIDEOGRAPHER: Good
2 morning. We're going on the record at
3 10:06 a.m. on April 3, 2025.

4 Please note that this deposition
5 is being conducted virtually. Quality
6 of recording depends on the quality of
7 camera and internet connections of
8 participants. What is seen from the
9 witness and heard on screen is what
10 will be recorded. Audio and video
11 recording will continue to take place
12 unless all parties agree to go off the
13 record.

14 This is Media Unit 1 of the
15 vide-recorded deposition of Dr. Quinn
16 Horn, in the matter, Marcellin versus
17 HP, Inc. and Staples, filed in the
18 United States District Court for the
19 Western District of New York.

20 This deposition is being
21 conducted remotely using virtual
22 technology. My name is Marcelo
23 Rivera, representing Veritext Legal
24 Solutions and I am the videographer.
25 The court reporter is Alexis Zinckgraf

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1 in association with Veritext Legal
2 Solutions.

3 I am not related to any party in
4 this action, nor am I financially
5 interested in the outcome. All
6 present counsel will be on the
7 stenographic record.

8 Will the court reporter please
9 swear in the witness?

10
11 Q U I N N H O R N, called as a witness,
12 having been first duly sworn by a Notary
13 Public of the State of New York, was examined
14 and testified as follows:

15
16 DIRECT EXAMINATION BY MR. SCHWARZ:

17
18
19 Q. Good morning, Dr. Horn.

20 A. Good morning.

21 Q. My name is Steve Schwarz. I am
22 one of the attorneys representing the
23 plaintiffs in this case, and I will be
24 asking you the questions today.

25 From looking at your materials

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1 that you provided, I would believe that
2 you've been through this process before,
3 correct?

4 A. The deposition process, yes. I
5 have gone -- yes.

6 Q. So I'm not going to bore you
7 with all the details, and if we talk over
8 each other, we can remind each other not to
9 do that, but other than that, I won't go
10 through the -- the spiel that I'm sure
11 you've been through a hundred times.

12 Did you receive the -- the
13 binder that we sent?

14 A. I -- I did and --

15 Q. Okay.

16 A. -- it's unopened. It's here.

17 Q. Okay. Thank you for verifying
18 that, and you can open it now, if -- if you
19 would, sir. I probably should have told you
20 that 20 minutes ago, but I forgot.

21 MS. WANEMAKER: Okay. Steve,
22 would you like to put something on the
23 record with respect to usual
24 stipulations?

25 MR. Schwarz: Sure. In fact,

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1 yes.

2 Alexis, we are stipulating that
3 the -- you can keep opening, Doctor,
4 that any objections are reserved for
5 trial except for objections to the
6 form of the question, which have to be
7 raised or waived, and the witness will
8 choose to read and sign, I believe,
9 right, Jackie?

10 MS. WANEMAKER: Correct. Thank
11 you.

12 MR. SCHWARZ: Okay.

13 A. Okay. So I have removed it and
14 that's what it says.

15 Q. Okay. Great. So --

16 A. Appears to --

17 Q. There are numerical tabs, and if
18 you could turn to the first tab, that's what
19 I have marked as Exhibit 1, and it's your
20 report with the appendixes to your report
21 that are attached to it.

22 (Exhibit 1, Report, was received
23 and marked for identification by the
24 reporter.)

25 A. Okay.

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1 Q. And I'd like to just start with
2 some of the information from Appendix B,
3 which is your CV.

4 A. It's okay. If you can just give
5 me just a second, several of the pages are
6 not in the rings. So I need to do a -- just
7 a little bit of engineering on the binder,
8 engineering, if you will, just to get
9 that --

10 Q. You go ahead and do that, so
11 they don't all fall over the place.

12 A. Exactly. Okay. Thank you for
13 that. And okay. So I'm sorry. You would
14 like me to go to which -- which page?

15 Q. Your Appendix B, which is your
16 CV.

17 A. Sure. Okay.

18 Q. So my understanding from looking
19 at it is that you -- your educational
20 background, your highest level was a PhD in
21 Metallurgical and Materials Engineering that
22 you got in 1998, correct?

23 A. Correct.

24 Q. And then your first employment
25 after getting your PhD was with?

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1 Eveready Batteries; is that correct?

2 A. Energizer/Eveready Battery
3 Company, yes.

4 Q. And can you tell us -- it says
5 you were a staff technology engineer, what
6 was the -- the nature of your work there for
7 those four years, from '98 to 2002?

8 A. Yeah, absolutely. The -- so the
9 -- as -- as a metallur [sic], just -- I was
10 actually replacing the corporate metallur,
11 just -- Energizer/Eveready at the time, in
12 the late 90s, was the largest battery
13 company in the world.

14 They had one metallur just on
15 staff, he was retiring. I happened to be
16 graduating with a metallurgical engineering
17 background with some knowledge of batteries
18 and so it was a great fit. So I replaced
19 the corporate metallur, who was retiring and
20 took over what was called the Materials and
21 Characterization Group, which was the home
22 for a number of things, assisting R&D with
23 materials, characterization, and also doing
24 corporate failure analysis on manufacturing
25 and battery products.

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1 So I led a team for -- to do all
2 of that. So my group had sort of all of the
3 character -- materials, characterization
4 tools necessary for doing high-end research
5 and development, as well as doing failure
6 analysis of product that was being
7 manufactured at the time. So field
8 failures, as well as failures that were
9 occurring in manufacturing facilities and
10 things of that nature.

11 Q. Was Eveready/Energizer [sic] at
12 the time manufacturing rechargeable lithium
13 ion batteries?

14 A. They were. When I first started
15 in 1998, they had a facility in Gainesville,
16 Gainesville, Florida, and that was a
17 facility where they were manufacturing 18650
18 lithium ion cells. So they -- the were --
19 they were ramping up.

20 So they were manufacturing 18650
21 lithium cells with the intent to
22 commercialize those cells. They ended up
23 selling that plant, I believe in 2000
24 or 2001, I -- I forget exactly which year,
25 and got out of the lithium ion business, but

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1 at the time, I was working with the
2 Gainesville folks, helping them solve
3 problems, again, with manufacturing and
4 failure problems with the -- with the
5 batteries and so forth.

6 Q. So let's just dive into that a
7 little bit more. So are you saying that --
8 that Eveready/Energizer never actually
9 commercially sold lithium ion batteries,
10 they sold the plant before the plant got to
11 the point of producing commercial batteries?

12 A. Correct.

13 Q. And so whatever you were doing
14 with regard to that plant was related to the
15 startup of the manufacturing process and
16 assisting them in their -- making sure the
17 products were -- were meeting
18 specifications?

19 A. Correct.

20 Q. Were you involved in designing
21 those lithium ion batteries in any way?

22 A. To the extent of looking at --
23 characterizing material -- materials'
24 parameters and materials' properties of the
25 active material and associated materials

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1 that were going into the batteries,
2 absolutely.

3 Q. So the -- the -- so the battery
4 chemistry, so to speak, was something that
5 you were involved with?

6 A. Yes.

7 Q. And in your report, you go
8 through the -- some of the basics of how
9 those batteries are constructed, so we'll --
10 we may look at that later.

11 With regard to the -- the
12 manufacturing process then and what you were
13 doing, did you do any studies of -- of
14 failures from the standpoint of energetic
15 failures of those batteries?

16 A. Yes.

17 Q. And tell me about that. What --
18 what types of studies did you do of
19 energetic failures of lithium ion batteries
20 during those two years that that plant was
21 there and you were there?

22 A. So, you know, I mean, you know,
23 obviously, you know, at the time, field
24 failures were not -- in lithium ion
25 batteries were not a huge concern at the

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1 time in the industry. Although, there were
2 -- the industry was starting to see some,
3 but, you know, the -- the idea was that they
4 really wanted a battery that was safer than
5 lithium prime -- most of the lithium primary
6 batteries.

7 Those are non-rechargeable
8 lithium batteries, and so the -- the types
9 of things that -- that you would be
10 concerned about would be things like
11 overheating, venting of -- of hot, or
12 caustic, or toxic gases, venting of gases
13 that could be potentially flammable, you
14 know, how to prevent that, how to minimize
15 that, how to control that, how to design a
16 cell in case it does have a, you know,
17 there's an internal defect, or it's misused,
18 or abused in some way, you know, how to test
19 for that.

20 So, you know, a lot of, you
21 know, external heating-type tests, a lot of
22 intentional defect tests, where you
23 manufacture the battery with intentionally
24 placed defects that you can then activate
25 later to simulate maybe an internal short

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1 circuit or something like that. Physical
2 abuse tests.

3 At the time, nail penetration
4 tests were very, very common in the
5 industry, because of some of the Japanese
6 standards that were -- that were in place.
7 So a lot of nail penetration tests. A lot
8 of what we called in the day, hot box tests.

9 They're mostly called oven tests
10 now, but guys that have been around long --
11 as long as I have, often refer to them as
12 hot box tests, but basically, you know,
13 heating the cells up in ovens and -- and
14 looking at what temperatures they will have
15 thermal events, and basically, starting to
16 build a foundation for understanding, you
17 know, how lithium ion batteries, you know,
18 fail under different conditions.

19 Q. So that was a mouthful. So let
20 me kind of break that down. So you directly
21 conducted empirical testing of lithium ion
22 batteries for -- for instance, overheating
23 and thermal events?

24 A. Correct.

25 Q. And where did that testing take

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1 place?

2 A. That testing took place in West
3 Lake, Ohio, in some of the old -- old labs
4 that were used for lithium cobalt oxide
5 testing in the --

6 Q. In what -- go ahead, I'm sorry.

7 A. No. That's -- that's fine.

8 Q. Now, the -- the lithium ion
9 battery chemistries from the 1998 to 2000
10 time period, there's been an evolution of
11 those batteries over time, correct?

12 A. There's been an evolution in the
13 -- in the technology -- I mean, so yeah.
14 Yes, there has been. There have been
15 significant improvements in the -- in the
16 materials and performance in -- of the
17 cells.

18 Q. So a lot of those -- the battery
19 cells from that year -- or for instance,
20 could not go through as many cycles as the
21 battery cells that they sell today of the
22 18650? They have a longer lifespan?

23 A. I would -- no, I would disagree
24 with that. At the time I was working at
25 Energizer, the goal was to get a thousand

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1 cycles on -- on -- on a cell to 80 percent
2 capacity. That was seen as, you know, at the
3 time, the industry standard. The industry
4 standard has now come down to about 300
5 cycles to 80-percent capacity for consumer
6 electronics.

7 I think the biggest improvement
8 has been energy density, as well as power
9 density for applications that require very
10 high power, like power tools and things of
11 that nature. So there -- there -- if you --
12 and cost. The cost of the -- of the
13 batteries has -- has dropped significantly
14 since that timeframe.

15 Cycle life has really not
16 actually improved surprisingly that -- that
17 much. Most of the improvements have been in
18 the -- in the energy density and -- and for
19 specific applications, power density, and
20 cost.

21 Q. Just so I understand, if you --
22 if you improve power density, does that also
23 improve the -- the length of time before you
24 have to recharge?

25 A. No. Power density is -- a power

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1 is how fast you can discharge the battery,
2 and energy is how much total energy the
3 battery stores.

4 Q. So the more energy the battery
5 stores, the -- the less frequently you'd
6 have to recharge?

7 A. For a -- for a -- for a
8 low-power application, correct.

9 Q. Would a laptop be a low-power
10 application?

11 A. A laptop is a low power,
12 high-energy application.

13 Q. So for a laptop, 18650
14 batteries, is it true then that -- that
15 they've improved with regard to the length
16 of time they'll run without being needed to
17 be recharged since 2000?

18 A. The -- given the same power
19 drain on, you know, load on the battery,
20 yes. The energy -- what we can call the
21 energy density of the battery has increased.
22 So the amount of capacity and voltage of the
23 battery has increased since, you know, the
24 -- the late 90s, early 2000s.

25 Q. Were you in any way involved

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1 with battery management systems, as well as
2 the cells themselves?

3 A. Only in so far as understanding
4 what the battery management systems do, you
5 know, as, you know, you know, controlling
6 overcharge, controlling overdischarge,
7 balancing circuits and things like that.

8 Understanding what they do, but
9 not in the design of a battery management
10 system. I'm not an electrical engineer. So
11 I understand what they do, I understand what
12 battery management systems need to do in
13 order to keep the cells happy in the battery
14 pack, but again, I'm -- I'm not an
15 electrical engineer.

16 Q. So let me just make sure I
17 understand from a timeframe standpoint.
18 What I was asking you specifically was:
19 During your time at Eveready, during the
20 time that that plant for the lithium ion
21 batteries were ramping up, was -- were you
22 involved in assessing how battery management
23 systems would work with cells?

24 A. I was part of a team of -- of
25 people that were looking at what was going

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1 to be required in a battery management
2 system for -- given for certain
3 applications, you know, so, you know, did
4 you need overdischarge protection, did you
5 need overcharge protection, do you want or
6 need balancing, do you need over-temperature
7 protection, do you need under-temperature,
8 those types of things.

9 So I would provide input as far
10 as for a given application, what the cells
11 would like, because lithium ion cells do
12 like to be operated in -- in a certain, you
13 know, comfortable voltage temperature window
14 regime, as well as charge rate and discharge
15 rate.

16 So -- so I would be part of the
17 team that would be informing the electronic
18 side of the group that would be designing
19 the battery management units and telling
20 them what we felt would be, you know, from a
21 cell level perspective, what would be
22 important for the battery management unit or
23 the battery management system.

24 Q. I can look up the name of it,
25 but see if I can find it quickly. Was the

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1 smart battery data specification in place at
2 the time you were doing that work?

3 A. I -- I -- I -- I -- I -- I'm
4 familiar with the smart battery
5 specification system. I -- I don't recall
6 if it was -- if it was in place at -- at the
7 time or not.

8 Q. Was -- was Eveready/Energizer
9 planning to -- to manufacture the entire
10 battery packs as opposed to just battery
11 cells at that point?

12 A. The intent was to do both.

13 Q. Okay. And so you weren't
14 involved in the battery management pack --
15 battery management system design, but you
16 were one of the people that informed that
17 team of the different -- the different
18 safety mechanisms that would be required?

19 A. Correct.

20 Q. Okay. And you mentioned a few
21 of them, but over-temperature, overcharge,
22 cell balance, overvoltage would be some of
23 those -- overdischarge, right?

24 A. Correct.

25 Q. And was the -- the -- your

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1 understanding then that the battery
2 management system was to provide those
3 protections in the circuit board that would
4 be part of a battery pack?

5 A. Yes. It was -- it was
6 understood at that point in time. With
7 lithium ion batteries being first
8 commercialized in the early 1990s, by 1998,
9 1999, it was definitely understood in the
10 industry that to get, you know, to maximize
11 the lifetime of the battery, you know, when
12 I say "lifetime," not, you know, how long it
13 takes before you have to charge it again,
14 but how long the battery will last, and, you
15 know, in -- in a certain application, you
16 know, how many cycles or how many years.

17 One needs to make sure that they
18 treat the battery in a way that minimizes
19 site reactions and things like that. Keep
20 the battery happy is what the -- the BMS is
21 designed to do. Keep the -- keep the
22 battery cell happy.

23 Q. Well, in addition to that, it
24 was also recognized by -- at least that
25 time, by the time you got your PhD, that

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1 these batteries also had a -- a safety risk
2 if they got to conditions that were
3 overcharged, over-temperature that could
4 result in a runaway reaction that's called
5 thermal runaway, correct?

6 A. Yeah, that was -- that was -- at
7 the time, it was recognized that there --
8 there were -- there were potential issues.
9 It was not well-understood, the mechanisms
10 at the time, but it was beginning to be
11 understood.

12 So there were, you know, some of
13 the seminal papers were being published in
14 the late 90s on -- on -- on safety on --
15 there's a lot of confusion back then,
16 because there was a lot of lithium --
17 lithium metal rechargeable, lithium
18 batteries, and a lot of inter -- the -- the
19 nomenclature had yet to be really
20 standardized at the time, but -- but yes.

21 I mean, it was -- there -- there
22 -- I believe in -- I believe it was '96 or
23 '97, the first big consumer battery failures
24 sort of hit the market and that was in --
25 with -- when Apple introduced a laptop with

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1 the first ever lithium ion -- first ever
2 lithium ion battery-powered laptop computer,
3 and they had some safety issues, and that
4 was -- that was probably in '96, '97, I
5 think, and that was sort of when the
6 industry really kind of started to, like,
7 key in, and say, all right, we don't really
8 have standards for this.

9 There were really no industry
10 standards or guidelines for -- for -- for --
11 for the usage of batteries at the time.
12 There was a lot of finger-pointing in the
13 industry at the time as well. There was a
14 lot of -- so, you know, the laptop, computer
15 companies would point the finger at the
16 battery pack companies, and the battery pack
17 companies would point the finger at the cell
18 manufacturers.

19 So eventually, they all got
20 together in the early 2000s and formulated
21 some guidelines, and then they -- they --
22 about ten years later, they -- they revamped
23 those and improved those for how one designs
24 batteries for notebook computer
25 applications, but back in the late 90s,

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1 there weren't a lot of industry guidelines
2 at that point.

3 Q. When you say "batteries," you're
4 also referring to battery management
5 systems, correct?

6 A. So yes, and that's a very
7 excellent question. I want to, you know,
8 even I am guilty of using the word "battery"
9 and "cell" synonymously. So technically
10 speaking, a battery is one or more cells
11 with -- when we're talking about lithium
12 ion, a battery is one or more cells with
13 some type of electronics in it.

14 So in -- in your cell phone,
15 your cellular phone, your mobile phone, it
16 has one lithium ion cell with a BMS unit,
17 and that one cell with the BMS is called the
18 battery. In your notebook computer,
19 typically, you have more than one cell. In
20 case of this instance, you've got six cells
21 with a, you know, in a, you know, battery
22 pack with a BMS. So that's your battery.

23 At any point, if I -- if I, you
24 know, please forgive me, because I will use
25 the word "battery" to talk about a cell

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1 sometimes. I really work hard not to, but I
2 might. Feel free to correct me.

3 Q. No, I apologize. I appreciate
4 that, actually, and I appreciate you
5 defining the terms so that we use the right
6 terms, because I want to make sure we're
7 both communicating with the same terms.

8 During the --

9 A. And just to make sure that we're
10 -- we're all on the same page, you know,
11 what normally gets everybody on the right
12 track is when I say, when you go to your
13 local grocery store and you buy a pack of
14 Double As off the -- off the pogo pin stand,
15 you know, each of those Double As is -- we
16 call them batteries, but they're actually
17 cells, right?

18 It's -- it's just chemistry in a
19 can with no electronics wrapped around it.
20 That is technically a cell. So, you know,
21 when we're talking about in this particular
22 case, we've got 18650s, those are lithium
23 ion cells of a certain size. Just like a
24 Double A battery is a alkaline cell of a
25 certain size, so --

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1 Q. Okay. Great. So going back to
2 your time then at Eveready/Energizer when
3 you were working with lithium ion batteries,
4 did you do research specifically of
5 attempting to provoke cells to go into
6 thermal runaway and study thermal runaway
7 reactions once those cells went into that --
8 that mode?

9 A. Yes. There -- there -- there
10 was -- I mean, I was part of, you know,
11 there's always teams of people. People
12 don't go, you know, go off into, you know, a
13 vacuum and do -- and do things on their own,
14 typically, in the industry.

15 There's always a team of people,
16 but yes. I mean, I was definitely part of
17 the -- the team that was doing things like
18 looking at, you know, how hot do you have to
19 get the battery before it -- it becomes a
20 safety risk, you know, how hot do you have
21 to get the battery before it starts to
22 maybe, you know, just have performance
23 degradation, right, you know.

24 Q. Let me -- let me just stop you a
25 minute, because I really want to focus on

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1 the thermal runaway part of it, and I know
2 that there were many other reasons you
3 attest and many other conditions you want to
4 look out for, but with regard to thermal
5 runaway itself, in other words, just seeing
6 what temperature -- what external
7 temperature you would have to reach in order
8 to have the battery cells go into -- or the
9 cells go into thermal runaway, did you
10 actually participate in those studies, you
11 -- hands-on involved with the -- the actual
12 data collection?

13 A. Yeah. I mean, some of that was
14 done in -- in Gainesville, Florida, where I
15 -- where I would -- I did -- I did go, and
16 then some of that was done at -- in the West
17 Lake facility, where -- and it was basically
18 an extension of the lithium primary work
19 that had been being -- had been ongoing at
20 Energizer/Eveready for, you know, since the
21 early 80s, and lithium primary batteries,
22 you run into the same issues.

23 There's thermal runaway events
24 there as well. So it's basically using the
25 same facilities, the same techniques, the

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1 same ovens, the same, you know, furnaces to
2 -- that were being done in the 80s and early
3 90s, and -- and even when I was there on
4 lithium primary to, you know, basically, use
5 that same technology and the same knowledge
6 base for looking at lithium ions.

7 Q. So did you design experiments
8 then to provoke the runaway in these cells?

9 A. I was part of the teams that
10 would look at how we should be doing those
11 tests -- how we should be doing those tests,
12 yes.

13 Q. Okay. So tell me the -- the
14 test that you were personally involved with
15 -- and did you publish anything from -- from
16 any of those studies?

17 A. I did not. Whether or not
18 anybody at Energizer did, I can't speak to
19 that.

20 Q. Okay.

21 A. My -- My guess would be no,
22 because there, you know, again, around 2000
23 or 2001, there was a business decision made
24 at a much higher level than I was. The
25 company was going to get out of the lithium

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1 ion battery business, and after that, the
2 focus was put on lithium primary batteries
3 in -- on the nonaqueous chemistry side of
4 things. So --

5 Q. In the -- in the experiments
6 then that you were involved with, that you
7 were hands-on involved with, tell me how the
8 -- the methodology that was used to keep the
9 battery and how the temperature of the
10 battery was measured to determine at what
11 level or what -- what temperature the
12 thermal runaway reaction would start.

13 A. So basically, three different
14 types of -- of heating methods were
15 employed, and quite frankly, are -- are
16 still employed, you know, again, a lot of
17 this stems from work that was done on
18 lithium primary in the -- in the 80s.

19 So you've got -- in no
20 particular order, you -- you -- you have,
21 you know, you're aware of, you know, there's
22 basically three different types of heat
23 transfer, right?

24 There -- there's -- there's
25 conductive, which is where you -- you

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1 transfer heat through the contact of a hot
2 surface with a surface that is at a lower
3 temperature, that's conductive. You have
4 convective, which is heat transfer through
5 air or -- or a gas, and then you have
6 radiant -- radiation, which -- radiant heat,
7 which is heat that's transferred through --
8 in -- basically, through infrared radiation
9 to -- to a -- to a sample.

10 So essentially, basically, what
11 we're doing is looking at three -- those
12 three types of -- of ways of doing it. So
13 conductive is -- generally, you can put the
14 battery on a hot surface where it's in
15 contact with a hot surface or you could --
16 you could put the battery into, you know,
17 we're talking about cylindrical batteries,
18 mostly at the time.

19 So you could put the battery
20 into a -- a form-fitting, like, a pipe
21 that's just a little bit bigger
22 inter-diameter than the battery is itself
23 and then heat the pipe up, so that the pipe
24 is then conducting the heat into the
25 battery.

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1 You can do convective, which is
2 essentially putting a battery in an oven
3 where it has minimal contact to hot surfaces
4 and does not have a direct line of sight to
5 a heating element. So the air is heating
6 the battery up, or you can have radiant,
7 where the battery is in the direct line of
8 sight of a heating element that is then
9 heating the battery directly. So those are
10 -- I mean, whenever you're doing battery
11 thermal testing, those are essentially the
12 three different categories of heating that
13 one would look at for -- for -- for doing
14 it.

15 Now, there's sort of a little
16 bit of a side category, which would be
17 direct exposure to a flame. So UL1642 has a
18 test -- standard -- has a -- what's called a
19 projectile test, where the battery is
20 exposed to a flame, directly exposed to -- a
21 flame is impinging on the cell itself.

22 So in that particular case,
23 there's a combination of convective and
24 radiant -- radiation heat. So that's sort
25 of a combination condition, where you may

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1 have a combination of two factors, but those
2 -- that's pretty much your -- your -- your
3 three primary categories, and then you may
4 have something like a flame impingement,
5 which may combine, you know, you know, more
6 than one type of heat transfer mode.

7 Q. When you were at
8 Eveready/Energizer, did you use all of those
9 methods in heating batteries to -- to
10 provoke them into thermal runaway?

11 A. Yes, we -- we did. I mean, I
12 can distinctly remember doing conductive
13 testing, doing oven testing, doing radiant
14 heat testing, as well as doing flame
15 impingement testing, yes.

16 Q. So my understanding of what you
17 said is for the radiant heating method, you
18 want to make sure that the -- there's a
19 direct line of sight from the source of the
20 radiant heat directly to the cell, correct?

21 A. Correct. I mean, you know, with
22 -- basically, you know, radiant heat is --
23 is infrared radiation, which is essentially
24 light that we can't see, and so that is, you
25 know, in order to heat the sample, it can't

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1 be shaded, right?

2 It's a direct line of sight heat
3 transfer mechanism. You can't, you know, I
4 mean, unless -- unless -- unless you're
5 using radiant heat to heat something else,
6 which then heats your sample through either
7 conductive or --

8 Q. That's -- that's not what I was
9 asking. I wanted to -- so the direct
10 radiant heat, the key is to have a direct
11 line of sight, so to speak, between the
12 radiant, the IR source, and the battery cell
13 itself?

14 A. So basically, if you're doing
15 raw -- raw cell testing, if you're doing
16 battery pack testing or if you're doing
17 testing of the batteries in a device, then
18 the cells may not be exposed to direct
19 radiant heat.

20 They -- they would then be, you
21 know, the outer-casing may be exposed and
22 then that heat would be convected to -- or
23 conducted in -- in the -- depending on the
24 type of heating that is employed to the
25 batteries.

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1 Q. So that's what I was going to
2 get at. So the -- in my experience, looking
3 -- learning a little bit about these battery
4 cells and not even anywhere near as much as
5 you know, I know that when they're sold
6 commercially, typically, the -- the battery
7 cells themselves are -- are wrapped in a
8 plastic-type coating, and then typically,
9 the battery packs that are actually inserted
10 into devices like laptops are then enclosed
11 in a hard plastic cell.

12 Is that something you're
13 familiar with?

14 A. So the batteries are just to
15 make sure the -- I believe -- I believe I am
16 familiar with that. I just want to put it
17 in -- in different terms that --

18 Q. And you might use a better term
19 than "plastic."

20 A. No. I -- I -- I think that
21 you're fine with that. The battery cells
22 are generally -- when we're talking about
23 18650 cells, they are generally, you know,
24 shrinkwrapped in a, you know, shrink-wrap is
25 a plastic that, you know, it's basically a

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1 thin plastic tube that you put around the --
2 the battery cell, heat that up, and it
3 shrinks and it sort of wraps around the --
4 the battery, and it provides -- and it's a
5 -- it is actually a safety component of the
6 safety of the battery, because it prevents
7 short-circuiting from the positive terminal
8 to the can when used correctly.

9 So that's your first -- that's
10 your first plastic layer. That's a -- it's
11 a very thin plastic that goes around the
12 cell. So typically, when you're looking at
13 battery cells, you don't see just a steel
14 can, right? It's got some kind of wrap
15 around it, and then generally, most people
16 never lay eyes on an 18650 battery cell even
17 though they use them on a day-to-day basis,
18 because they are in a battery pack.

19 You're not going to go to
20 Walmart and buy an 18650 cell. They're
21 generally only sold by cell suppliers to be
22 incorporated into a battery pack of some
23 kind. That battery pack may be plastic, as
24 in the case in this instance. It could be
25 other materials, but it's generally in some

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1 sort of -- of a pack.

2 Q. So when -- when you were
3 involved with the direct testing of the
4 18650 cells and you used the radiant heat
5 source, did you typically put the -- the
6 bare metal can cells in line with the
7 radiant heat source, or did you just
8 typically put them into a battery pack
9 situation with the shrink-wrap and then with
10 the hard plastic around it, or did you do
11 both?

12 A. Again, you know, we're -- we're
13 talking 25, 24 years ago, but I mean, I
14 recall that we were doing both cells and --
15 and packs for -- we had -- Energizer had
16 some specific customers lined up for -- for
17 -- for their cells and battery packs, and so
18 we were looking at both -- both cells and as
19 well as some prototype packs at -- at the
20 time.

21 So I believe that both cells and
22 packs were being done, yeah. I'm pretty
23 sure we were doing heat -- I'm pretty sure
24 we were doing thermal testing on both -- on
25 both cells and battery packs. That, I'm

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1 fairly confident of.

2 Exactly what tests were being --
3 we were doing -- and we were -- and with
4 respect to the cells, most of the testing
5 was done on cells, but prototype packs, we
6 were definitely doing testing on prototype
7 packs as well. I just don't recall the
8 details on exactly what -- what heat
9 transfer mechanisms we were -- we were
10 looking at.

11 Q. So would it be a fair statement,
12 though, that -- that the amount of radiant
13 heat that would be required to get a -- a
14 battery -- a lithium ion battery cell
15 without its plastic wrapping to a
16 temperature that would provoke thermal
17 runaway, it would take more heat if you had
18 the insulation material of the plastic
19 around it to get to that same temperature?

20 A. I don't think that would be a --
21 I don't think that would be a fair
22 statement. Maybe --

23 Q. You think that -- that having
24 something --

25 A. Hold on --

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1 Q. Let me just restate it. So what
2 you're saying, I think, if I understand, is
3 that the plastic wrapping and the plastic
4 would have no impact on the radiant heat
5 transfer from the radiant heat source to the
6 battery cell. The -- the radiant heat would
7 not absorb any -- the plastic wouldn't
8 absorb any of that radiant heat, it would
9 all go to the cell.

10 Is that what your test showed?

11 MS. WANEMAKER: Object to the
12 form.

13 You can answer.

14 A. You know, you're asking me some
15 pretty specific questions about some testing
16 that I did, you know, was involved with a --
17 a very long time ago.

18 Q. Okay. Well --

19 A. And --

20 Q. You're a materials expert,
21 right? I mean, you know materials, correct?

22 A. I -- I -- I am -- I will tell
23 you that I am a -- I am here as a battery
24 failure analysis expert, and to the extent
25 that you really want detailed analysis on

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1 thermal conduction, and thermal
2 conductivity, and heat transport, that would
3 -- those would be great questions to direct
4 to fire cause and origin folks.

5 I will tell you this, and this
6 is what I know, that when you are looking at
7 -- especially when you're looking at radiant
8 heat transfer, radiant heat transfer is
9 significantly affected by the surface
10 condition of the sample that you have.

11 So let's say you have a -- a
12 battery cell in a can that has no plastic
13 around it. A lot of the radiant heat is
14 going to be -- can be reflected off of that
15 surface.

16 So it actually -- for the same
17 amount of radiant heat on that surface
18 versus as -- versus if you put a black
19 plastic wrapper around it, which would
20 absorb more of that heat, as opposed to
21 reflect that heat back, you could -- for the
22 exact same heat flux, you could definitely
23 heat a cell up faster with a plastic around
24 it that absorbed the heat, versus having the
25 cell just exposed with either no plastic on

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1 it and a reflective metal surface or a
2 plastic that did not absorb the IR as much
3 as, say another -- another plastic.

4 So it depends on how much of the
5 IR that's being put into the sample is being
6 absorbed by the sample versus how much is
7 being reflected, and that is a function of
8 the surface conditions, as well as the
9 surface materials. That's basically the
10 extent of what I know, and I don't talk
11 about any of that in my report, so --

12 Q. I would beg to differ. I think
13 you do, but we'll talk -- we'll show you
14 why.

15 With regard to what you're
16 saying, though, if I understand it
17 correctly, you don't have any experience in
18 how the plastic wrapping and the plastic
19 case of the battery management pack would
20 impact the efficiency of radiant heat to
21 heat battery cells, you're saying that's not
22 in your line of work or not your specialty?

23 A. I mean, I'm going to say that --
24 that it will have an impact, absolutely.

25 Q. What will have an impact?

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1 A. That, you know -- the -- I mean,
2 doing radiant heat on a battery cell that
3 has no plastic wrapped around it -- around
4 it versus the same cell in a battery pack
5 that has material around it. Yeah. I mean,
6 the material will have an impact, whether it
7 -- whether it makes it -- heats the cell up
8 slower or heats the cell up faster, is going
9 to depend on the materials.

10 Q. And for the typical materials
11 that were used for battery packs, for laptop
12 computers, and I think in your -- in your
13 report, you had actually gotten a exemplar
14 battery pack for this type of computer that
15 you looked at, right?

16 A. Yeah. An HP exemplar, yes.

17 Q. Yeah. And so, you know --

18 A. So I want to make sure we didn't
19 get -- we didn't get a non-OME exemplar.
20 We --

21 Q. Right. An HP exemplar.

22 A. An HP exemplar, yes.

23 Q. One that -- that -- that looked
24 like the other one, but wasn't -- wasn't
25 identical to it, because the other one

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1 wasn't a exemplar, correct?

2 A. You're talking the "other one"
3 being the instant?

4 Q. Yes.

5 A. Yes.

6 Q. The one that was in the
7 computer.

8 A. Correct, correct.

9 Q. So that had a black, hard
10 plastic coating that was -- that contained
11 the entire battery pack, and then the
12 individual cells were -- were shrinkwrapped,
13 as you described in your exemplar, correct?

14 A. That is correct. That's --

15 Q. And is it your opinion then that
16 having that heavy plastic casing for the
17 battery pack and the shrink-wrap would
18 somehow enhance the ability of radiant heat
19 to get through that plastic and heat the
20 battery cells faster than if you just took a
21 metal cell and put it in front of a radiant
22 heat source?

23 A. It -- it -- it may, yes. I
24 mean, that --

25 Q. Do you have any -- any data that

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1 -- in other words, have you seen any studies
2 or have you done any studies that would show
3 that -- that having all that plastic around
4 it would somehow speed up the reaction of --
5 of heating up the battery cell?

6 Is there -- can you tell me,
7 like, where you get that -- that evidence?

8 A. I think that's basic heat --
9 that's basic heat transfer. It could --
10 again, it could -- it could heat it up, or
11 it could speed it up, or it could slow it
12 down.

13 So basically, it's -- it's about
14 how much of -- so you have a certain heat
15 flux going into the surface of the sample.
16 How much of that heat is absorbed by the
17 sample and how much thermal mass is the
18 plastic contributing. If the plastic
19 absorbs more heat than what it's
20 contributing to the thermal mass compared to
21 how much heat is going to be reflected by a
22 bare metal surface, then it's going to heat
23 the thermal mass up faster given the same
24 heat flux.

25 If, on the other hand, it is

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1 absorbing less heat than what the thermal
2 mass of the plastic is contributing, then --
3 I'm sorry, somebody is -- can you give me
4 just -- I'm sorry, can we take a very quick
5 break?

6 Q. Sure. Let's go off the record.

7 THE VIDEOGRAPHER: The time is
8 10:47 a.m., and we're going off the
9 record.

10 (An off-the-record discussion
11 was held at this time.)

12 THE VIDEOGRAPHER: The time is
13 10:50 a.m., and we're back on the
14 record.

15 Q. So just going back to the -- the
16 -- what we were talking about at your days
17 of Eveready/Energizer testing 18650 cells to
18 provoke them into thermal runaway.

19 As you sit here today, do you
20 ever recall a specific test that you did of
21 a battery pack using radiant heat trying to
22 -- to provoke thermal runaway in at least
23 one of the cells in that battery pack?

24 A. Are you referring specifically
25 to Energizer, my time at --

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1 Q. Yeah. I want to start there,
2 and then I'm going to take you through the
3 rest of your career.

4 A. Sure. Yes -- yes. I do
5 specifically recall us doing -- I don't
6 remember if it was radiant or -- or if it
7 was convective. I believe it was radiant,
8 you know, it's -- you're -- you're
9 stretching my memory back to, you know, to a
10 very --

11 Q. Okay. Do the best you can.

12 A. -- to some very specific
13 testing. I believe that we were doing some
14 radiant heat tests, because we were looking
15 at packs for a potential customer that was
16 for outdoor applications, and -- where there
17 would be a fair amount of solar heating on
18 -- on the pack, and so there was concern as
19 far as, you know, how, you know, how hot
20 could the -- could the cells get within a
21 pack due to radiant heat from -- from --
22 from a -- from solar source, from the sun,
23 right?

24 Being left on the blacktop or
25 something like that in -- in -- in sun, but

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1 that was -- that was a long time ago, sir.

2 Q. Okay. And did you do any
3 testing of battery packs actually in devices
4 that were then applied -- or where radiant
5 heat was applied?

6 A. I -- boy, that -- doing
7 device-level testing in Gainesville. I
8 believe there was -- there was some
9 device-level testing in Gainesville, thermal
10 testing on full-scale devices, but -- and I
11 was part of that team, but I was more
12 focused on the cells and the packs than --
13 than the device at the -- at the time.

14 Q. Would you agree that -- that
15 when you take a battery pack, that the cells
16 are wrapped -- shrinkwrapped, and then
17 they're in their own casing and then they're
18 put into a device that would provide another
19 barrier to the radiation, that that would
20 also be a factor in how quickly the radiant
21 heat would heat the cells?

22 A. I'm going to go back to my
23 previous testimony to answer that question,
24 and -- and say that whether or not it -- it
25 is -- will be the same, or slower, or faster

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1 is a function of how much the packaging
2 around the cells absorbs the heat, the
3 radiant heat, combined with the -- the --
4 the thermal mass of the packaging.

5 So if it's absorbing the radiant
6 heat faster than what a raw cell would
7 absorb the radiant heat and the thermal mass
8 of the packaging is relatively small
9 compared to the cells, which is normally the
10 case, because generally, the mass of a
11 battery pack is dominated by the mass of the
12 cells and the plastic around it, the housing
13 is -- is generally a very minor, you know,
14 contributor to that.

15 So you know, if the -- if the
16 plastic is absorbing the heat from the
17 radiant source better than what the battery
18 cells would absorb the radiant heat -- from
19 the radiant heat source, then it would
20 actually heat the batteries faster.

21 The batteries themselves may not
22 be being, you know, heated in that
23 particular case, you've got radiant heat
24 heating the exterior plastic, which then
25 heats the cells through -- generally through

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1 conduction or convection depending on the
2 design of the battery pack.

3 One could imagine a situation
4 where it might be similar, you know, the
5 same or even, you know, heated slower
6 depending on if there were insulation
7 materials that were being employed and,
8 things like that, but again, it depends on
9 the design of the pack, and I agree that it
10 can be different.

11 Q. And -- and my question really
12 was not as much theoretical as do you have
13 any -- any experience in actually measuring
14 the difference in radiant heat absorption of
15 a battery pack in a device versus cells that
16 are exposed directly to radiant heat.

17 Have you had any experience
18 directly measuring the difference in the
19 heat absorption by the cell in those two
20 different scenarios, and if so, I wanted to
21 know what data you had going from that?

22 MS. WANEMAKER: I'm just going
23 to make an objection to the form. Are
24 you limiting this to his time at
25 Eveready or --

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1 MR. SCHWARZ: Yeah. We're going
2 to go -- yeah. At Eveready for now.
3 Thank you, Jackie.

4 MS. WANEMAKER: Uh-huh.

5 A. I think what we saw at -- at
6 Eveready -- and this was true not just with
7 lithium ion, but -- but other types of -- of
8 batteries --

9 Q. Well, what I want to know, like,
10 in the lithium ion, in particular, do you
11 have any specific information that you can
12 tell us that you remember about the
13 difference in absorption in those lithium
14 ion battery cells between when they were in
15 a pack, or in a pack in a device, or when
16 they were the bare cells?

17 If you remember actually seeing
18 data. I don't -- I know we talked about
19 what you think theoretically could be and
20 there are many different possibilities
21 depending on the materials, but I'm just
22 asking for actual physical evidence that you
23 saw.

24 A. I remember being surprised with
25 certain pack designs that the batteries

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1 would actually heat up faster within the
2 pack due to -- in -- in -- with -- in --
3 with radiant heat than they would -- the
4 battery cells, the cells would -- could heat
5 up faster in -- in -- in a pack with radiant
6 heat compared to raw cells.

7 Compared to convective heating
8 of the battery pack -- of a battery pack,
9 where the cells would be essentially
10 insulated by the -- the plastic housing of
11 the battery and would generally heat up
12 slower. Again, it depends on the design of
13 the battery pack, and you can design --

14 Q. Yeah. I know that -- I know
15 that there are a lot of possibilities,
16 Dr. Horn. I'm just asking of your personal
17 experience, because we'll be able to get
18 through the deposition much faster if you
19 try to specifically answer my question.

20 You're being helpful and I'm not
21 criticizing that, but I'm just saying that I
22 was asking you for specific data that you
23 saw in the test that you were involved with,
24 with your team whether you demonstrated --
25 that you're saying that you saw it both

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1 ways.

2 A. Yes.

3 Q. Okay. That's -- that's fine. I
4 apologize for -- I don't mean to cut you
5 off, but I do want to try to stick to my
6 outline and move through this as quickly as
7 we can and -- and get you back to your --
8 your day.

9 A. In both ways when -- I just want
10 to clarify. When we say "both ways" being
11 -- and you got a certain heat rate with raw
12 cells being exposed to a certain radiant
13 heat flux, both ways being, it could be
14 slower with a pack, in a pack, it could
15 faster in a pack, it could be maybe very
16 similar in a pack depending on what
17 materials are being used and how the pack is
18 designed.

19 Q. And you don't remember any
20 specific numbers on that, you just remember
21 there were qualitative differences between
22 the -- the three modes, right?

23 A. Yes.

24 Q. Okay. Now, in the studies that
25 you did at Eveready/Energizer, you said that

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1 you tested individual cells, but you also
2 tested cells that were -- were wired
3 basically in the same way that a pack would
4 be wired, correct?

5 A. We tested cells in prototype
6 packs, yes.

7 Q. And were they typically four or
8 six cells wired in a -- in a pack the way a
9 laptop computer battery pack might be?

10 A. I don't remember the number of
11 cells that were in a -- in the packs. I
12 think the packs we were looking at for the
13 applications were slightly larger than that,
14 but generally, you know, the packs would be
15 wired in a combination of series and
16 parallel cells, so, you know --

17 Q. So --

18 A. Go ahead. Please go ahead.

19 Q. I'm sorry, go ahead. Okay. I
20 apologize. I talked over you and I'm not
21 supposed to do that, and I apologize to
22 Alexis for doing that.

23 So in these tests then, did you
24 typically try to raise the temperature of
25 the battery to a certain level to see if

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1 thermal runaway occurred, or did you heat
2 the batteries -- the battery packs, or the
3 battery cells to provoke thermal runaway, or
4 did you do both?

5 A. So both, you know, and at the
6 time the -- the term "testing to failure"
7 was becoming very popular in engineering
8 parlance, meaning that rather than test to a
9 specific pass level, you want to -- you want
10 to test beyond the pass to see how close you
11 were to failure for a specific, you know,
12 you know, pass criteria.

13 Let's say that pass criterion is
14 exposure to a certain temperature for a
15 certain amount of time, right? So yeah. I
16 mean, we would -- we would test up to
17 certain temperatures, and then, you know,
18 see if it would pass, and then analyze the
19 product to look -- see -- exposure to a
20 certain temperature or a certain amount of
21 time, what that would do to the product, but
22 then we would generally try to test to
23 failure, because management was always --
24 always wanted to, well, all right, it passed
25 here, but where is -- how far -- what is the

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1 safety marg, right?

2 How far above that can we go
3 before we see a -- we see failure, right?
4 Is it just -- just a little bit more or is
5 it a lot more, what's the safety margin, and
6 you don't know the safety margin until you
7 test to failure, and --

8 Q. So the answer to the question
9 would be, yes, you tested both?

10 A. Yes.

11 Q. Okay. And with regard to
12 monitoring the actual temperature of the
13 cell, how did you do that?

14 A. Generally, at the time, it was
15 thermocouples attached to the cell when I
16 was at Energizer. I believe we had one
17 infrared camera at the time, but it's -- was
18 not nearly as fancy and sophisticated as
19 infrared cameras are now. It was really
20 only a camera in that you could focus on a
21 single point and measure a temperature.

22 You couldn't take, like, a
23 picture and get, like, a, you know, a
24 colored version of the image that
25 represented the various different

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1 temperatures. So --

2 Q. Okay. So the --

3 A. -- thermocouples were the
4 primary source of temperature measurement.

5 Q. So when you were testing a full
6 battery pack then, would you typically
7 attach thermocouples to each of the cells in
8 the battery pack somehow and then use that
9 to evaluate the temperatures inside the
10 cells?

11 A. Generally, yes. I mean, the
12 goal was, if possible, to -- to attach
13 thermocouples to all of the cells. I
14 wouldn't say that was done in every single
15 situation, but I mean, you would -- to get
16 some kind of a thermal map of the -- of the
17 pack during -- during the heating test.
18 That was -- that was desirable.

19 Q. Okay. And again, I'm really
20 pinpointing a very specific kind of test.
21 So that's what I'm directing this at. I
22 know you did a lot of different kinds of
23 tests.

24 So I believe you said you did
25 tests using radiant heat in a battery pack

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1 of multiple cells to provoke at least one of
2 the cells into thermal runaway, and then
3 decided what temperature it needed to get to
4 in order for that to happen, right?

5 A. We -- that was a test that was
6 conducted, yes.

7 Q. And you were actually physically
8 present for those tests?

9 A. In some situations, I was
10 physically present. In other situations,
11 the testing was done offsite, and I may --
12 and I may or may -- I went to Gainesville, I
13 think, three times for -- for auditing and
14 -- and testing.

15 So in some cases, I reviewed
16 data that was conducted at Gainesville. I
17 was -- I was at the -- on the center in West
18 Lake, Ohio. Manufacturing was in
19 Gainesville, Florida. So although there
20 was, you know, we -- there was a team of
21 people, I wasn't present for, you know,
22 physically present for -- for every test,
23 but I reviewed -- I was part of the team
24 that reviewed all of the -- the testing
25 data.

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1 Q. And what were the -- what were
2 the cell temperatures that were required to
3 -- to raise the cells to those temperatures
4 to provoke a thermal runaway reaction?

5 A. I -- I -- I -- I don't remember
6 specifically, you know, the -- it hasn't --
7 I can't give you specific numbers. I can --
8 I can give you generic temperature ranges.

9 Q. Okay.

10 A. So generally, you know --

11 Q. I'm talking about from your
12 test, right? Not -- because we'll talk
13 about what you've learned since then, but
14 I'm just saying, do -- do you recall what
15 the range was from the test or you're saying
16 that you can apply what you know now to what
17 you think it must have been?

18 A. The -- the latter of -- of -- of
19 what you -- what you just said.

20 Q. Okay. So we -- we can move on
21 then. We can talk about research that
22 you've looked at.

23 Do you -- did you have any
24 experience -- again, back in the -- in the
25 time with Eveready/Energizer, with having

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1 one cell be provoked into thermal runaway
2 and then the heat from that thermal runaway
3 reaction by convection or -- or other
4 contact, I guess -- I guess, that's -- what
5 was the one for that direct contact, was
6 convention?

7 A. Conduction.

8 Q. Conduction. I'm sorry,
9 conduction. By conduction, provoking other
10 cells into thermal runaway, is that -- is
11 that a type of reaction that you witnessed?

12 A. That wasn't something that I
13 recall from our lithium ion testing. That
14 was something that we were doing with
15 lithium primary testing at the time, but
16 that wasn't something that I -- I don't
17 recall us being very focused on that with
18 lithium ion testing.

19 Q. Okay.

20 A. When I was at Energizer.

21 Q. I've been using the word
22 "thermal runaway reaction," and that -- that
23 is a specific description, I guess, of a
24 reaction that, once it gets a certain
25 temperature, because of a breakdown within

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1 the -- the battery chemistry itself and the
2 battery cell, has -- is a cell sustaining,
3 and then increasing temperature reaction,
4 right?

5 Is that how you describe it or
6 probably much more artfully than I just did?

7 A. In general -- generally, that's
8 -- that's pretty much it. I think that
9 where -- again, there's -- there's a little
10 bit of inconsistency in -- in --
11 unfortunately, in -- within the industry and
12 within academic parlance and what exactly
13 does thermal runaway mean.

14 So there -- there -- there are
15 -- there are a couple different key -- key
16 points as you begin to heat a lithium ion
17 cell up, a fully-charged lithium ion cell
18 up, that are important, but thermal runaway,
19 from a chemical engineering standpoint, if
20 you ask just a chemical engineer what
21 thermal runaway is, they're going to say,
22 hey, you know, it's whenever you get a
23 situation where the heat generated by the
24 object causes the object to heat up, and it
25 raises the reaction rate to generate more

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1 heat.

2 So it raises the -- it increases
3 the heat generation rate, which increases
4 the temperature, which increases the heat
5 generation rate, and now -- and you get a --
6 sustained as a thermal runaway reaction. It
7 can be fast or it can be slow. Depends on
8 what -- what's going on.

9 In lithium ion battery parlance,
10 generally, we talk about thermal runaway as
11 the point where you can no longer quench the
12 reaction. So, you know, you can't throw it
13 in water, you can't cool it down, you can't
14 stop it through normal means. It means it's
15 going to go to completion. That's normally
16 what we -- when we refer to thermal runaway.

17 Although, some people still
18 refer to thermal runaway of lithium ion as
19 what most people refer to as the onset
20 temperature, which is the temperature at
21 which the battery will begin to self-heat.
22 So there's -- there's a temperature where it
23 begins to self-heat, but you can -- you can
24 stop it by cooling it down, and there's a
25 temperature range that that occurs, and then

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1 there's a point where you can't stop it.

2 It's sort of like lighting a
3 match, heating a match up, right? Once you
4 actually light that match, it's into a
5 thermal runaway chemical reaction process.
6 You can't quench that, but up to that point,
7 you can heat that match up pretty, pretty
8 hot before it actually does that, and cool
9 it back down and it will ignite.

10 Q. Okay. So with regard to the --
11 the -- the point where it's unstoppable then
12 -- well, let me withdraw that question.

13 There was an article that was
14 referenced by -- by Dr. Martin. I think the
15 authors were -- the author was Sorensen, and
16 did you happen to read that article?

17 A. Yes, I did.

18 Q. And in the Sorensen article, I
19 think they talked about phases, where the
20 first phase was sort of the normal operating
21 temperature battery, and then the second
22 phase was when it began to have a reaction
23 that was generating heat, but that reaction
24 could -- could be stopped if -- if the heat
25 were dissipated from the cell, and then a

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1 point where the -- the cell got into Phase
2 3, which was where it was, what you would
3 describe as thermal runaway, and couldn't be
4 stopped.

5 Is that -- is that parlance that
6 you're familiar with, generally?

7 A. Yes. So Stage 1 is temperatures
8 below what we would refer to as the onset
9 temperature. Stage 2 is temperature between
10 the onset and the thermal runaway
11 temperature, and above the thermal runaway
12 temperature, that's when things kind of get
13 kick off -- kicked off and you can't stop
14 it.

15 Q. And in your experience, do you
16 -- do you have numbers or number ranges for
17 each of those transitions that you -- that
18 you believe are -- are fairly consistent
19 throughout the lithium ion battery
20 community?

21 A. I -- I -- I do. I -- I do.

22 Q. Can you tell us what they are?

23 A. Well, we need to specify the
24 chemistry. So let's specify the chemistry
25 first. When I say "the chemistry," we're

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1 talking about lithium ion, but you are aware
2 that lithium ion -- the term "lithium ion,"
3 really covers a wide range of -- of
4 chemistries.

5 Q. Okay. So --

6 A. So -- I -- just -- let me just
7 go ahead and finish with this, because I'm
8 going to try to make your life simpler here.
9 So --

10 Q. I'm always happy for that.

11 A. With respect to what we're
12 talking about here, we're talking about --
13 in this instance, we are talking about a
14 lithium ion cell designed in, you know,
15 manufactured in, you know sometime between
16 2010 and 2020, probably sometime around
17 2015, forward to the electronics industry.

18 It is going to have a graphite
19 negative electrode, it's going to have a
20 lithium cobalt oxide positive electrode.
21 That's important, because those two
22 materials will control the temperature for
23 onset and for -- and for thermal runaway.

24 The negative electrode material
25 and the type of -- and the type and -- as

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1 well as the surface area of that, will
2 control your onset temperature, and then the
3 positive is what controls your -- the
4 temperature for thermal runaway. So given
5 that chemistry --

6 Q. That chemistry.

7 A. That chemistry, and assuming
8 that we're fully charged, right?

9 Q. Right.

10 A. Assuming we're fully charged,
11 because if we're half charged, it changes.

12 Q. Oh, fully charged.

13 A. Fully charged.

14 Q. That chemistry.

15 A. Then what you're typically
16 talking about is full onset. The lowest
17 I've ever -- I believe we've ever measured
18 for onset is around 70 degrees Celsius.
19 Typically, you're in the 85 to 95 degrees
20 Celsius range.

21 Q. Okay --

22 A. That -- that's where the --
23 that's where the majority is going to be.
24 In some special cases, we may be a little
25 bit below that. In some special cases, a

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1 little bit above it. Eighty-five to 95 is
2 pretty much where you detect onset, and --
3 and that detection is using the accelerating
4 rate calorimetry.

5 That's pretty much the industry
6 standard for -- for detecting that. It's
7 very -- it's difficult to do, and -- and a
8 lot of times, it's easy to overshoot and get
9 artificially high measurements. So pretty
10 much, the industry relies on accelerating
11 rate calorimetry or arc for that onset
12 temperature.

13 Q. Okay. So that --

14 A. And --

15 Q. And using -- using Sorensen's
16 terminology then, that would be the point
17 where it goes from the normal operating
18 range Phase 1, into the beginning of thermal
19 runaway generation of heat Phase 2?

20 A. That's -- yes. That is where
21 you can start to detect and measure the cell
22 beginning to generate heat. It's really
23 small, really small. Typically, you're
24 looking at .05 to .1 degrees per minute
25 temperaturized [sic]. So very, very

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1 temperature --

2 Q. Okay.

3 A. -- increases, but it's
4 detectable. So that's -- that's -- and
5 normally, when you specify an onset
6 temperature, you have to specify your
7 detection limits for that, but that's --
8 that's -- that's consistent with Sorensen
9 transition from Stage 1 to Stage 2.

10 Q. Okay. And then the next
11 transition point, from Stage 2 to Stage 3,
12 is the point of no return, basically, when
13 the cell goes into a thermal runaway
14 reaction that can't be quenched even if you
15 take heat away?

16 A. Correct.

17 Q. And what is the temperature
18 range for that transition that you've
19 experienced from stage -- in -- in the type
20 of lithium ion battery we're talking about,
21 manufactured in the year that we're talking
22 about, what would the temperature range be
23 for that transition from Stage 2 where if
24 the -- the -- the reaction can be reversed
25 or stopped, to Stage 3, where it can't?

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1 A. Generally, between 180 and 195
2 degrees Celsius, and if we're talking a
3 brand new battery, fully charged, graphite,
4 lithium cobalt oxide, polyethylene,
5 polypropylene, you know, bilayer, trilayer,
6 separator, convention, you know, runt of the
7 mill, meat and potatoes, lithium ion cell
8 for consumer electronic applications, 180 to
9 195.

10 Q. Thank you. Now, once the -- the
11 lithium ion battery cell of this type gets
12 to that 180 to 195 range and gets into that
13 secondary phase, there's usually some
14 outward appearance of change in the battery
15 cell itself, correct?

16 In other words, at some point,
17 as the temperature continues to rise,
18 different things are going to happen and
19 they're not good things?

20 MS. WANEMAKER: Objection to the
21 form.

22 You can answer if you can.

23 A. Well, before that, things can
24 happen that will be visible that are not
25 good things. So --

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1 Q. Okay. So where does the venting
2 usually take -- start to take place, at what
3 temperature?

4 A. So generally, in this type of
5 cell, the -- the first thing that we'll see
6 happen is the polyethylene component of the
7 separated mouths and the voltage will drop.
8 That typically happens around 125 to 230
9 degrees Celsius.

10 Q. And can you see that from the
11 outside of the cell or is that something
12 that you know from the inside -- from
13 examining after the fact?

14 A. You see that from measuring --
15 the continuous management of the voltage
16 during the testing.

17 Q. Okay.

18 A. That's normally something that's
19 done, is a -- is a voltage management.
20 Venting of the cell is going to typically
21 occur -- it's a little bit larger range, but
22 -- because it depends a little bit on the
23 head space and how much excess electrolyte
24 is in the cell, but basically, venting is
25 occurring because of -- of the partial

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1 pressure of electrolyte building up within
2 the cell, and that's generally 145 to
3 155 degrees C.

4 Again, I don't want to make --
5 want to make sure I'm not putting hard
6 numbers on this. I don't want somebody to
7 -- to come up and say, hey, this vented at
8 143, that's outside your range. I mean, I'm
9 just saying, like, generally, that's a --
10 that's a good rule of thumb, 145 to 155 C,
11 is where the cell will vent, and -- and in
12 an 18650 cell, that we're talking about, two
13 things happen when the cell vents, because
14 it's not just the -- it's not just the vent.

15 The vent is part of what's
16 called the current interrupt device
17 component, and that will break -- that
18 breaks the circuit of the cell. So when the
19 cell vents, two things happen. It relieves
20 the internal pressure, and then also, it
21 will open the circuit to prevent any
22 additional charging or discharging.

23 So when the cell vents, you will
24 typically see that, and if you're watching
25 the cell, you'll see that as, you know,

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1 maybe a spray or mist coming out of the
2 cell. If you're doing electrical
3 measurements on the cell, the cell will go
4 to an extremely high resistive level,
5 because the circuit has opened.

6 Q. Now --

7 A. -- measure voltage.

8 Q. Let me slip in questions every
9 now and then, and then -- then you can
10 answer them, okay? So when the cell vents,
11 the gases that vent, are at times,
12 flammable, correct?

13 A. Yes. The -- the electrolyte in
14 lithium ion batteries is -- is a flammable
15 organic solvent. So whenever -- the -- when
16 it vents -- when a cell vents, prior to
17 thermal runaway, most of it is going to be
18 electrolyte aerosol, which is going to be
19 flammable, yes.

20 Q. And so when a cell goes through
21 this process of going from Stage 2 --
22 through Stage 2, when did you start to -- to
23 typically see flames coming out of that --
24 of that cell?

25 A. You don't see flames coming out

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1 of the cell during Stage 2, because
2 although, you have -- you have a -- you have
3 something that's flammable, you don't have
4 an ignition source, right?

5 So it's like you're, you know,
6 well, I don't use hairspray anymore, maybe
7 you do, but you take -- you can take a
8 hairspray can and you can spray -- you can
9 spray your head or spray it into the air,
10 that's flammable, but it doesn't have a
11 flame unless you, you know, put a match in
12 front of it and then spray it, and then you
13 have a flame, right?

14 So when the cell vents during
15 Stage 2, you're not going to see any kind of
16 -- you're not going to see -- unless there's
17 an ignition source, unless there's already a
18 preexisting flame, you know, nearby that,
19 you know, is within the fuel, oxygen mixture
20 where that is a flammable -- that's a
21 flammable mixture. Generally, during Stage
22 2, we don't see any flames.

23 Q. Now, the -- when the -- those
24 gases are released, they're not flammable,
25 they're also -- we're talking about at -- at

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1 high temperatures, correct? We're talking
2 about 150 degrees Celsius range that that
3 gas would be at, right?

4 A. The -- yes, yes.

5 Q. And then as that process
6 continues, the heat continues to rise. Then
7 you get to Stage 3, and is that where you
8 typically will find, at some point, an
9 explosion?

10 A. I want to be cautious on the --
11 the use of the term "explosion." Again,
12 it's unfortunately one of those terms that
13 is band-aided about, even -- even amongst
14 academics and -- and professionals to
15 mean --

16 Q. Well, let's just use whatever
17 terminology you want to use. At some point,
18 there's -- there's a rupture of the cell and
19 cell contents can be ejected. What do you
20 want to call that?

21 A. Well, I -- if you're -- you're
22 skipping ahead a bit, because generally, we
23 don't get rupturing of -- of the cell can in
24 ejection of the contents like we see in this
25 case. The most common thing that we see is

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1 when you hit thermal runaway, right?

2 So when you hit 180 to
3 195 degrees C, and you start to begin and
4 you -- and you start the chemical reaction
5 between the cathode material and the
6 electrolyte, the cathode decomposes,
7 produces oxygen which very quickly oxidizes
8 and burns the electrolyte.

9 That's when the cell temperature
10 really skyrockets, and, you know, increases
11 by hundreds of degrees Celsius per second.
12 It gets well-above -- it can get well-above
13 -- for a fully-charged cell, the melting
14 point of aluminum. It can eject materials
15 that are red hot. While it's ejecting those
16 materials, it can be ejecting gases -- the
17 gas mixture, which it can be flammable with
18 the right amount of oxygen from air, and
19 it's those particulates that are coming out
20 with that gas mixture that can ignite that.

21 Think of it -- think of it like
22 a propane torch that you might have in your
23 garage or your basement for doing whatever
24 maintenance and stuff that you use a propane
25 torch for, right? You can turn the propane

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1 on the torch, and there's a flammable gas
2 coming out of that and it's not igniting,
3 but you have a striker that you put in front
4 of that, and then you strike an arc or a
5 spark, and it ignites that -- that -- that
6 probate.

7 Basically, what's happening for
8 a very short period of time coming out of
9 the 18650 cell is a flammable gas, that when
10 mixed with oxygen from air and a spark that
11 can be emitted from the cell itself, can
12 emit a -- a -- a -- can ignite that -- that
13 gas mixture.

14 Q. Okay. And you said then that
15 the -- the -- once it gets to a certain
16 point above the 180 to 195 range, the
17 internal components of the cell can heat up
18 to such an extent that they can -- you said,
19 melt aluminum?

20 A. Generally, a fully-charged 18650
21 cell that gets to that thermal runaway
22 condition, will get above the melting point
23 of aluminum. So --

24 Q. And what would that be just to
25 -- to give us a ballpark of what the Celsius

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1 temperature would be?

2 A. Are you going to quote me?

3 You're going to test my -- my memory on the
4 melting point of aluminum. I'm going to say
5 660 degrees C.

6 Q. Okay. So that would be --

7 A. So you can check that on -- you
8 can Google that and you can give me a hard
9 time if I'm not close, but I'm thinking --

10 Q. No, that's okay.

11 A. I'm thinking it's 660 degrees C.

12 Q. And is that something that also
13 you measured in these imperial tests that --
14 that you did when you were working for
15 Eveready/Energizer?

16 A. Well, the nice thing about the
17 melting point of aluminum is the current
18 collector in -- on the positive electrode
19 for a lithium ion cell is aluminum. So if
20 you examine the cell after thermal runaway
21 and you have a melted aluminum current
22 collector, you know it got above the melting
23 point.

24 It's very difficult to measure
25 the internal temperature of a cell while it

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1 is going into thermal runaway. So what we
2 have to do as scientists and engineers that
3 are studying these things, is we look at the
4 -- we can sort of bracket the different
5 materials.

6 So you have an aluminum current
7 collector that melts at around 660 degrees
8 C, as I recall. You have a copper current
9 collector that melts at around 1,070 degrees
10 C, I think. Don't hold me to that, though.
11 If I have a break, I'm definitely going to
12 Google that, but around 1,070 degrees C, I
13 think, and aluminum melts, copper doesn't in
14 -- in that -- in that thermal event.

15 So the temperature -- and this
16 is very similar to a house fire or a
17 building fire, where aluminum components in
18 the fire will melt, but copper wiring won't
19 unless there is an article -- electrical
20 energy, you know, pass through.

21 So in the absence of an arc,
22 aluminum -- or copper won't melt, but
23 aluminum will in a typical building fire.
24 So we know that we're in that temperature
25 range, somewhere between the melting point

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1 of aluminum and the melting point of copper
2 inside -- inside the cell.

3 Q. And then the contents of the
4 cell, if they were ejected, they would be
5 ejected at about that temperature, somewhere
6 between aluminum melting and copper melting,
7 between 600 and over 1,000 degrees Celsius?

8 A. In an -- in an -- in the
9 situation where the cell vents the way it's
10 designed to, then in the ejecta, we call it
11 the ejecta, that come out the vent of the
12 cell, then yes. They will be the ejecta,
13 which is the part -- that are coming out of
14 the cell, as well as the gas, will be
15 ejected from the cell within that
16 temperature range.

17 Q. And sometimes the -- the cell
18 itself ruptures or the -- the cap is blown
19 off and the actual copper internal
20 components of the cell are also ejected,
21 correct, which is what happened in this
22 case?

23 A. In four cells in this case, the
24 -- the can -- so we have two cells that
25 exhibited what we would typically call a

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1 crimp release, and two cells that we would
2 typically refer to as a can rupture, yes.
3 That -- and that -- that occurs, you know,
4 almost always exclusively due to -- to
5 external heating of the cell, as we've been
6 discussing.

7 We've only been discussing
8 extra, you know, failure of the cell due to
9 external heat imposed onto the cell to this
10 point. We haven't talked about internal
11 cell faults and other things. So we've been
12 talking all about external heat. So --

13 Q. So you're saying -- let me just
14 stop you there for a minute.

15 So you're saying that thermal
16 runaway reactions that are caused by
17 internal events in the cell overcharge,
18 overvoltage, over-temperature, those --
19 those types of thermal runaway reactions
20 never result in either a -- a crimp release
21 of the -- of the contents of a rupture of
22 the cell?

23 That -- that -- basically, if
24 you have a -- that kind of -- of -- of fault
25 that causes thermal runaway, you'd never see

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1 any ejection of the internal components. Is
2 that what your testimony is?

3 MS. WANEMAKER: Object to the
4 form.

5 You can answer.

6 A. That was a very long question,
7 sorry.

8 Q. Let me -- let me rephrase --

9 A. Counselor, can you -- can you --
10 can you maybe --

11 Q. Sure, I'll rephrase it.

12 So there are -- there's --
13 there's two different ways that you can --
14 you can have the internal cell temperature
15 reach the point of thermal runaway, where
16 these reactions take place.

17 You can have the external heat
18 source or you can have a fault within the --
19 the system or -- or too much charge, too
20 high of voltage. So there's two different
21 ways, right? With me so far?

22 A. Sure. I'll -- I'll -- I'll --

23 Q. I mean, I just --

24 A. I'll -- I'll take those two
25 buckets, okay.

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1 Q. Okay. Now, in the bucket of the
2 internal, there's a number of different ways
3 that internal temperature can get to that
4 point. I'm -- I'm with you on that, but I'm
5 just talking about internal heating versus
6 external heating.

7 We okay with that?

8 A. Yes.

9 Q. Okay. So I think you said for
10 external heating, you see this reaction
11 where -- in at least certain circumstances,
12 the -- the copper windings of the -- the
13 inside of the battery cell can be ejected
14 out of the battery cell?

15 A. From external heating, yes.

16 Q. Yes. Are you saying that that
17 never happens for internal heating?

18 A. For the -- the -- for the vast
19 majority -- I may be able to come up with --
20 I may be able to, after over 25 years of
21 experience, come up with a way to do it, but
22 the vast, vast majority of the internal
23 defects that result in a -- in a -- in a
24 thermal runaway instant in an 18650 cell, do
25 not result in the ejection of -- of -- of --

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1 of contents, either through a crimp release
2 or a can rupture.

3 The -- and the reason for that
4 is the -- the venting mechanism is highly
5 effective and specifically designed to
6 release the gases at the rates that they're
7 being generated at when a cell has an
8 internal defect, as opposed to through an
9 external heat situation, where you're
10 pumping energy into the cell and when the
11 cell finally fails, it's got all of its
12 stored energy from being fully charged, as
13 well as all the thermal energy you pumped
14 into it.

15 You get much more rapid
16 generation of gases that can overwhelm the
17 vent and cause failure of the steel can. So
18 that's one of the things -- and that's
19 something that I've published on, certainly,
20 and many people have published on, is --

21 Q. Which -- which -- which articles
22 did you publish that in?

23 A. It's my -- it's all in my CV.

24 Q. No. But I mean, can you give me
25 a specific article that you -- in the period

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1 you -- literature that you published that
2 makes the point that -- that ejection of the
3 internal contents of the cell, rarely, if
4 ever happens, from internal faults in the
5 cell?

6 A. I -- I would -- I would say the
7 great place to start is my book chapter in
8 the Handbook of Batteries on methodologies
9 for failure analysis of -- of batteries.
10 So --

11 Q. So the good news is, I guess, it
12 becomes pretty easy for you, that any time
13 there's ejection of contents, it has to be
14 from external heating?

15 A. Or relatively small battery
16 packs, that -- that -- that's certainly
17 something that we are -- we are -- we are
18 very much looking at, and it's not just
19 myself. I mean, there are many other people
20 that have published on it.

21 Q. I didn't ask if you were looking
22 at it. I'm just saying that based upon your
23 understanding of the science, any time you
24 see ejection of internal contents, it
25 virtually has to be external heat, it can't

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1 be any fault within the battery that caused
2 that.

3 Is -- is that your conclusion
4 that you reached just by knowing that?

5 MS. WANEMAKER: Object to the
6 form.

7 You can answer.

8 A. No, sir. You've got to look at
9 the design of the pack, and how many cells,
10 and how thermal the thermal propagation
11 could -- could -- could, you know, you know,
12 how it could progress through the battery
13 pack, you know, and -- and -- and other
14 evidence.

15 So you got -- you can't just
16 take one thing and look at it, but in
17 general, cells don't expel their contents
18 due to an internal cell fault. 18650 cells,
19 designed for consumer electronics, which are
20 different than 18650 cells designed for
21 power electronic applications, but 18650
22 cells designed for consumer electronics,
23 high-energy cells, don't expel their
24 contents due to an -- due to internal cell
25 faults, and the reason for that --

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1 Q. That's sort of an axiom in the
2 industry. That -- that's something that --
3 that is basically published and everybody
4 knows that, that if you have ejection of the
5 internal components, it must be from some
6 external heating source?

7 A. Well, it's certainly published
8 from -- by myself and -- and others, so yes.
9 Yes, there are --

10 Q. Okay.

11 A. -- publications on that, yep.

12 Q. And you've never seen anybody
13 disagree with that, like, anybody in the
14 published literature, could be somebody like
15 me disagree with it, but I'm saying, in the
16 -- in the period you published literature,
17 that's pretty much the universal belief,
18 that any time there's ejection of the cell
19 contents, it also has to be from an external
20 heating source, except in exceptional
21 circumstances you can't even think of?

22 A. Oh. I can think of exceptional
23 circumstances, yes. I mean, you could --
24 you could charge -- you can charge -- you
25 can bypass the -- the CID and change the

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1 cells in an extremely high rate beyond what
2 they're capable of taking and possibly get
3 ejection of the contents. There may be --
4 you can -- you can plug the vents.

5 We get -- we -- we -- we do this
6 by design. We, you know, in order to
7 understand what the pressures, internal
8 pressures, need to be to cause can failure,
9 we -- we will design experiments to plug
10 vents and to -- so we can measure what those
11 pressures are for the can to fail and things
12 like that.

13 So I mean, you can -- you can do
14 that, and there may be applications out
15 there, where vents are plugged. I mean,
16 there -- there are many different uses of
17 18650 cells, where vents could be plugged
18 due to -- from debris, from, you know, from
19 -- from contamination or intrusion of
20 moisture or other things can affect how, you
21 know, how the vents -- or the design of the
22 cell -- the design of the pack.

23 One could potentially, you know,
24 plug the vent just based on how you -- you
25 attach -- you attach your -- your leads to

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1 the -- to the cell or if you pack in some --
2 in some cases, some people feel that packing
3 in insulation material around the cells is a
4 good thing or incapsulating the cells in
5 epoxy is a good thing. Those types of
6 things can reduce the rate at which the
7 gases can come out, right?

8 So in no way, shape, of form am
9 I saying, I can look at a pack at post-fire,
10 see its expelled contents and say,
11 (untranscribable noise), that was external
12 heating. What I am saying is, in the
13 absence of things, you know, could
14 potentially block, you know, crazy different
15 scenarios, and I can come up with many of
16 them, what we see -- and this is based on
17 25 years of experience in the industry,
18 doing almost exclusively battery failure
19 analysis is, you don't get expulsion of
20 contents from 18650 cells due to internal
21 cell faults.

22 Expulsion of contents is almost
23 always a very strong indicator that you had
24 external heat attack. Especially in
25 situations where you have multiple cells or

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1 most of your cells from a pack have expelled
2 their contents. That is very, very
3 compelling strong evidence that you have
4 external heat attack.

5 Q. Okay. Thank you for that
6 answer. You have a list of litigation cases
7 that you've worked on the last four years
8 that have been provided, and I don't want to
9 go through each one of them, but I wanted to
10 ask you: Did -- which of these, if any of
11 them, involved 18650 batteries that went
12 into thermal runaway?

13 A. Okay. So this is Appendix C.
14 Sorry -- sorry for turning my head over
15 here, I got this -- I got my folder off to
16 the side. So this is Appendix C, correct?

17 Q. Right.

18 A. Okay. So let me -- okay. So
19 one page, 1 through 8. So let me just go
20 through these very quickly. Number one --

21 Q. You don't have to tell me about
22 each one of them, just tell me which ones
23 involve thermal runaway.

24 A. I'm going to -- I'm just going
25 to go through it really quick, say "yes" or

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1 "no."

2 Q. Okay. Thank you.

3 A. Yep. "Yes" means, yes, it's
4 thermal runaway and applies to 18650s. "No"
5 means it does not.

6 Q. Thank you.

7 A. Number one, no. Number two, no.
8 Number three, yes. Number four, no. Number
9 five, no. Number six, no. Number seven,
10 yes. Number eight, no.

11 Q. Okay. So the two "yeses" were
12 cases where you worked for Hewlett-Packard,
13 correct?

14 A. Correct.

15 Q. And were they -- they were both
16 18650, you said?

17 A. Correct.

18 Q. And were they fire or explosion
19 events?

20 A. They -- they -- they were events
21 where there was a fire, and the batteries in
22 a notebook computer were alleged the source
23 of the fire.

24 Q. Okay. And there's another
25 expert for HP that has testified in this

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1 case being Mr. Galler, do you know him?

2 A. I do know Don Galler, yes.

3 Q. Was he involved in any -- either
4 of those two cases; do you recall?

5 A. I -- I don't recall. Let me --
6 let me -- just looking at the years, no. I
7 -- I know that in -- well, so the two cases
8 -- so three and seven are basically the same
9 case, right?

10 So -- so that's, you know, the
11 three is the trial and seven is the
12 deposition. Yeah. So -- so -- and I -- and
13 I do remember the trial, specifically. I
14 was the only expert that -- for HP that
15 testified at that trial. I don't know -- so
16 I don't recall if Don Galler was involved
17 with that case or not.

18 Q. Did -- did those HP laptop fire
19 cases involve unauthorized battery packs for
20 that case -- I guess just one case?

21 A. It did not.

22 Q. Did not, okay. And I assume, in
23 -- in those cases, you determined that
24 whatever happened -- where the fire had
25 nothing to do with the HP battery pack,

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1 correct?

2 A. Correct. That -- that damage to
3 the pack, and it was -- was a result of
4 external heat on -- on the battery pack,
5 yes.

6 Q. Now, have you -- this only
7 covers your last four years. Have you been
8 involved in any HP cases -- Mr. Galler
9 testified that in most of the fire cases
10 he's looked at for HP, there was an
11 unauthorized battery pack that was involved
12 with the fire and explosion from the -- from
13 the HP laptop.

14 Has that been your experience as
15 well?

16 A. I can only think of one other
17 case that I've been involved with HP that
18 involved an unauthorized battery pack.

19 Q. And when was that?

20 A. I -- I -- I don't -- I don't
21 have an -- I -- I -- that -- that was an
22 international case, and I was not deposed
23 and -- and did not testify. So it wouldn't
24 -- it wouldn't be in my testimony list
25 anyway even if we went back.

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1 I want to say that that was
2 probably seven years ago, maybe eight -- six
3 years ago -- five to six -- I'm -- I'm
4 guessing.

5 It was -- it was a minor case
6 that was -- an international case that I --
7 I was -- I was involved at the periphery,
8 but I haven't testified on -- on any other
9 cases or written any reports on any other
10 cases involving HPs that were using
11 non-authorized batteries; to my
12 recollection.

13 Q. Have you ever studied
14 unauthorized battery packs looking for
15 whether safety features were incorporated
16 into those for HP?

17 A. For HP?

18 Q. In other words, have you ever
19 worked for HP to do that type of
20 investigation? That was a poorly-worded
21 question.

22 A. I think only on that -- that
23 international case that -- that I mentioned.

24 Q. Okay. If you turn to Appendix A
25 of your report, and that's entitled

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1 "Material Reviewed."

2 A. Yes.

3 Q. And are these the materials that
4 you looked at in preparation for your report
5 prior to the -- the completion of your
6 report?

7 A. Yes. Yes, they -- they would
8 be, yes.

9 Q. Okay. So among them, were the
10 reports of the plaintiff's experts, the
11 first three, correct?

12 A. That's correct, yes.

13 Q. And you looked at the Allegany
14 Fire Investigation Report and all the
15 photographs that came with that?

16 A. Correct.

17 Q. And then you looked at the
18 deposition testimony of Carol Marcellin, who
19 is in the house, and Lee Atkinson, who's the
20 expert in -- that works for HP?

21 A. Yes. I'm not sure that it was
22 done in -- in that specific order, but yes.

23 Q. Okay. Well, that's the order
24 they're listed in. I didn't mean -- I read
25 them in that order.

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1 A. Yep.

2 Q. And Mr. Atkinson also testified
3 in his deposition that you were at, about
4 his investigation of fires that resulted
5 from unauthorized battery packs; do you
6 recall that?

7 A. I -- I do.

8 Q. And --

9 A. I mean, I recall -- I recall
10 reading it. I don't recall the specifics.

11 Q. Okay.

12 A. So if you're going to ask me
13 questions about his deposition, I -- I would
14 say that you may have to point me to
15 specific --

16 Q. Sure. But do you recall him
17 saying that -- that he became aware during
18 investigations of fire cases that there were
19 unauthorized battery packs that lack safety
20 devices that were required by HP?

21 A. I -- I recall that -- I seem to
22 recall -- again, I recall him saying
23 something to that effect, that -- that HP
24 started to see instances around maybe 2018,
25 2000 -- and they implemented some systems in

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1 2019.

2 Q. Okay.

3 A. Something to that effect, but I
4 -- I could have my dates wrong. I recall --
5 I remember -- I recall him saying something
6 to the effect of -- and it was either -- I
7 think it was Lee Atkinson.

8 I recall seeing something in --
9 either in the -- it was Atkinson's
10 deposition or it was in Interrogatories, I
11 -- I don't recall which.

12 Q. Okay.

13 A. But it was said that -- that,
14 you know, there was a period of time where
15 HP -- that HP really wasn't concerned about
16 it, because they weren't seeing, you know,
17 any significant prevalence of -- of -- of
18 issues, and then at some point, they started
19 seeing -- they started seeing it, and so
20 they implemented some fixes.

21 Q. Okay. Did you review the
22 testimony of the other HP witness that was
23 deposed in this case, Mr. Pipho, P-I-P-H-O?
24 It's not listed here, but I just was
25 wondering.

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1 A. I don't recall -- I don't --
2 when -- at the point -- I don't think that I
3 did review that. I -- I may have seen some
4 snippets from it, maybe in Dr. Sala's
5 report, but I -- I don't think that I
6 actually read -- read that deposition.

7 Q. Okay. And then number seven on
8 your list is the scene inspection notes and
9 photographs of Greg Gorbett, and those were
10 items that you looked at in order to prepare
11 your report, correct?

12 A. Correct. And in fact, I believe
13 I include some of Mr. Gorbett's photos in --
14 in -- in my report.

15 Q. But you recall specifically
16 reviewing the scene inspection notes and
17 photographs of Mr. Gorbett, correct?

18 A. Yes. I -- I believe I received
19 a folder with -- a PDF folder with -- with
20 photos and -- and photos of some notes that
21 he took during the inspection.

22 Q. Okay. And Mr. Gorbett was the
23 -- the fire investigator expert that was
24 sent by HP to go to the investigation of the
25 scene of the fire in February of 2020,

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1 correct?

2 A. That was before I was involved
3 with the case, but -- but that's my
4 understanding.

5 Q. And when did you get involved in
6 the case?

7 A. That's a good question. Hold
8 on, let me see if I got the -- the project
9 number.

10 So the project number on my
11 report starts with 21. 2110, so that would
12 be late 2021 would have been when I was
13 retained, because that was when the project
14 was authorized. So late 2021. I can -- I
15 know it's late 2021, because the project
16 number is 10,054, and we typically have
17 around 11 to 12,00 projects a year in
18 Exponent, so --

19 Q. So with regard to Exponent then,
20 there's another Exponent expert that has
21 testified and that's Dr. Myer [sic]. Do you
22 know Dr. Myers?

23 A. I -- I -- I do know Dr. Myers.

24 Q. And would the project number for
25 you be different than the project number for

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1 Dr. Myers?

2 A. Yes. I believe in this
3 particular case, it would be, because we
4 were retained -- yeah. It would be
5 different. I would -- I would think it
6 would be different -- normally -- normally,
7 the project number goes with the expert.

8 Whether or not the -- as opposed
9 to the -- the -- the matter. So if there
10 are multiple, you know, Exponent experts on
11 a particular project, then there would
12 typically be different project numbers.

13 Q. So then you -- you list the lab
14 inspection notes and photographs of Don
15 Galler, correct?

16 A. That is Item 8, yes.

17 Q. And Don Galler was the HP expert
18 that went to the laboratory where they took
19 the materials that Mr. Gorbett and others
20 chose to be analyzed in a laboratory.

21 Mr. Galler was there to -- to
22 witness that laboratory inspection?

23 MS. WANEMAKER: Object to the
24 form.

25 You can answer.

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1 A. My understanding is that -- that
2 Galler was present at at least one
3 inspection of the -- of the evidence at a
4 laboratory, yes.

5 Q. Right. So in other words,
6 Mr. Galler didn't go to the scene.
7 Mr. Gorbett went to the scene with others
8 and you list those others, we're going to
9 get to that, in your report, and then they
10 chose certain items to bring to a
11 laboratory, and Mr. Galler went when they
12 did that examination in the laboratory of
13 the items removed from the scene?

14 A. That was a very long question
15 that had many questions folded into it. So
16 I don't think I can say a "yes" or a "no."
17 If you could divide that up for me, that
18 would be fantastic.

19 Q. Well, what -- what was it that
20 Mr. Galler -- what -- what items were looked
21 at that when they went to the scene -- I'm
22 sorry, withdraw that question.

23 Mr. Galler went to the
24 laboratory and it was the fire research
25 technology laboratory in Sodus, New York,

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1 where certain items were evaluated in
2 October of 2020 or, you know, later in the
3 year that the fire occurred, correct?

4 A. That's my -- yes, that's my
5 understanding.

6 Q. And what was your understanding
7 of -- of where the items came from that were
8 evaluated during that examination?

9 A. I -- I -- I would point you to
10 Figure 10 of -- of my report, which has a --
11 a listing of the -- of the items.

12 Q. Right. But I was asking if --
13 if -- where those items that are listed
14 there came from.

15 A. I -- I -- I guess I don't -- I
16 -- I would -- I don't --

17 Q. What did --

18 A. I don't --

19 Q. Did they come from -- did they
20 come from the scene of the fire?

21 A. That's my understanding.

22 Q. Okay. That's what I wanted to
23 know. That was part of my long question.

24 I said that a selection was made
25 in February by the investigators of things

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1 to take to a laboratory, they were taken to
2 a laboratory, looked at in October, and
3 Mr. Galler was there when they were looked
4 at?

5 A. Again -- again, you got to
6 divide that up. I have no idea when the
7 selection was made, whether it was February,
8 what year it was. Certainly before 2020, I
9 -- I don't know. All I can say is, that's
10 what I understand -- Figure 10 in my report
11 is what Galler looked at, so --

12 Q. And -- and just so I -- do you
13 know when the fire was?

14 A. Make sure I get you an accurate
15 date. January 24, 2020.

16 Q. So the items that were taken,
17 were taken at least after January of 2020,
18 correct?

19 A. That would be my understanding,
20 yes.

21 Q. Okay. Then your list of items
22 -- turn back to it, I apologize.

23 A. You're -- you're referring to
24 Appendix A, list of --

25 Q. Appendix A, yes. You -- you

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1 list an article by somebody named -- is it
2 Bankole or Bankole?

3 A. Which number? Yeah.

4 Q. Twelve?

5 A. Yeah, Bankole.

6 Q. And then you list an article
7 written by the lead author, Yuan?

8 A. Yes.

9 Q. And then 14, you list the
10 National Fire Protection Association Guide
11 for Fire and Explosion Investigations from
12 2017?

13 A. Yes.

14 Q. Now, is that -- is that what's
15 also called 921?

16 A. Yes, it is. Yes, it is.

17 Q. And so you looked at the 2017
18 version, not the 2024 version?

19 A. I've looked at the 2017 version,
20 yes.

21 Q. Okay. You understand there has
22 been an update since then?

23 A. I do, yes.

24 Q. Okay. And then you list an
25 appendix by somebody named Reddy?

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1 A. Correct. That's the -- Reddy is
2 the editor of the Handbook of Batteries,
3 yes.

4 Q. Okay. And what is that
5 particular -- that's the appendix that
6 relates to battery failure analysis?

7 A. Yes. As -- as -- as it states
8 in the document there. Appendix H,
9 Methodologies For Battery Failure Analysis,
10 yes.

11 Q. And then you list two United
12 Laboratories specifications?

13 A. Correct.

14 Q. And then what's the last one,
15 18?

16 A. In an -- it's an international
17 standard testing of -- of lithium ion
18 batteries.

19 Q. And is that the sum total of
20 everything that you reviewed to prepare for
21 your report?

22 A. I think it's the sum total of
23 things that I went back to specifically
24 review. Obviously, you know, you know, I --
25 I know a lot from, you know, 25 years of

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1 doing battery failure analysis. So there's
2 -- there's a lot of, you know, just inherent
3 knowledge that I rely upon, but -- but yes.
4 Those -- that's the material that I reviewed
5 for this specific case, yes.

6 Q. Since you've -- you've produced
7 your report, have you looked at other
8 materials about this case prior to today?

9 A. Certainly I have, yes.

10 Q. And would that include the --
11 the reports -- the rebuttal report of
12 Dr. Martin and the rebuttal report of
13 Mr. Karasinski?

14 A. It would, yes.

15 Q. And what else would it include?

16 A. It would include the rebuttal
17 report of -- oh, I can never think --
18 remember his name. It starts with an L.
19 He's another fire investigator.

20 Q. He didn't do a rebuttal report.
21 So that would be his --

22 A. Oh -- I guess I reviewed the
23 primary report after -- after I submitted my
24 report. So I have reviewed that. I've
25 reviewed the -- sorry, I don't have a list.

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1 I've reviewed the -- as I've said, the
2 rebuttal report of Martin, as well as --
3 there -- there were some new references and
4 citations in Martin's rebuttal report that
5 were not in his opening report that -- that
6 I've reviewed. I've reviewed Martin's
7 deposition. I've reviewed -- is there
8 anything else --

9 Q. Did you review Mr. Galler's
10 deposition?

11 A. No, I didn't review Mr. Galler's
12 deposition. I did review Dr. Myers' report
13 and Dr. Sala's report. As -- as -- as --
14 there might be some other documents, but
15 that's what I recall at this point.

16 Q. No, that's great. So let's move
17 on then to -- and I know it's getting close
18 to noon --

19 MS. WANEMAKER: Yeah.

20 MR. SCHWARZ: But -- why don't
21 we go off the record.

22 MS. WANEMAKER: Yeah, good idea.
23 Thank you. I was just --

24 THE VIDEOGRAPHER: It's 11:55,
25 we're going off the record.

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1 (An off-the-record discussion
2 was held at this time.)

3 THE VIDEOGRAPHER: The time is
4 12:10 p.m., and we're back on the
5 record.

6 Q. So I think in your -- in this
7 morning's testimony, you provided -- your
8 general opinion, you said, is pretty
9 universally held, that catastrophic failures
10 of lithium ion battery cells form thermal
11 runaway are almost exclusively caused by
12 external heat sources; do you recall that
13 testimony?

14 A. I just want to make sure -- when
15 you say catastrophic failure, what you're
16 referring to, I believe, correct me if I'm
17 wrong, is failure of the -- and we're
18 talking specifically cylindrical 18650 cells
19 and we are talking about the failure of the
20 can, two types of failure, we see both in
21 this particular instance.

22 What we would generally call a
23 crimp release and a can rupture. Those are
24 generally a result of external heat attack,
25 yes. As opposed to an internal cell fault

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1 mechanism.

2 Q. And I think you -- you said, not
3 only generally, but the majority, but
4 99.9 percent, right?

5 A. I --

6 MS. WANEMAKER: Objection to
7 form.

8 You can answer.

9 A. I didn't put a number on it, but
10 the vast majority, yes.

11 Q. Okay. And the 18650 are the
12 most common cells used in consumer products,
13 correct?

14 A. Not -- not currently, no. That
15 -- that would be incorrect. For consumer
16 product laptops, phones, tablets, generally
17 nowadays, it's either prismatic or -- or
18 pouch cells.

19 Q. Okay. But at -- at -- during
20 the period of time prior to the current
21 time, 18650s were predominate, at least for
22 laptops, correct?

23 A. I want to say in 2010 for
24 notebook computers, I would say that --
25 yeah, 18650s were -- were the -- were -- I

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1 don't recall what fraction, but I think that
2 they were the majority. More than 50
3 percent would have been 18650s, yes.

4 Q. So in the -- if you turn to Tab
5 18, and I've marked as Exhibit 2, that's the
6 Yuan article that you referenced in your
7 report.

8 (Exhibit 2, Yuan Article, was
9 received and marked for identification
10 by the reporter.)

11 A. Yes, I am there.

12 Q. And in that report, in the
13 introductory section, if you look at it,
14 there's a sentence in the first column that
15 says, the Occupational Safety and Health
16 Administration (OSHA, 2019) reports that the
17 U.S. Consumer Product Safety Commission
18 identified over 25,000 overheating or fire
19 incidents involving more than 400 types of
20 lithium-ion powered consumer products over a
21 five-year period.

22 Did I read that correctly?

23 A. Yes.

24 Q. And so the -- the overheating
25 and fires caused by lithium ion batteries

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1 has become a -- a major issue in the last
2 decade; would you agree with that? 25,000
3 incidents.

4 A. I mean, I guess. I think the
5 numbers, I guess, speak for themselves. I
6 don't know if I want to put a, you know,
7 gauge, if that's, you know, the severity of
8 that, but that's -- that's -- that's what
9 CPSC has reported, yes, according to Yuan.

10 Q. Right. And you -- you cited
11 this article, so I assume you cited it,
12 because it was a reliable source for
13 information like this?

14 A. Yep, yes.

15 Q. Okay. So the next says, the
16 safety issues pose a great challenge for the
17 wider application of lithium ion batteries
18 in large power-consuming devices, and that
19 would include electric vehicles, correct?

20 A. It -- it -- it would include
21 electric vehicles, yes.

22 Q. And the next sentence says, the
23 major cause for catastrophic failure of --
24 for lithium batteries is thermal runaway
25 that occurs when heat generated from

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1 exothermic reactions inside a battery
2 outpaces heat dissipated from the battery
3 leading to a rapid increase in temperature
4 and pressure that further increases the
5 reaction rate.

6 Did I read that correctly?

7 A. Yes.

8 Q. And you would agree with that,
9 correct?

10 A. Yes.

11 Q. And the next sentence says, if
12 unmitigated, this self-accelerating process
13 will lead to cell rupture and the venting of
14 toxic and highly flammable gases, and the
15 release of heat.

16 Do you agree with that?

17 A. I -- I -- I agree with it to a
18 certain extent in -- in that -- again,
19 unfortunately, this is a situation where the
20 term "rupture" is not universally agreed
21 upon, and also keeping in mind that, you
22 know, we're talking about lithium ion cells
23 in general.

24 So when we talk about rupture of
25 a cylindrical cell, that's different than

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1 rupture of a pouch cell or rupture from a
2 prismatic cell. The latter two, pouch and
3 prismatic cells, tend not to have dedicated
4 venting mechanisms.

5 So generally, the casing itself,
6 either the pouch or the prismatic can, will
7 -- will tear, if you will, and that's
8 generally what we refer to as -- as a
9 rupture. I cannot think of the exact
10 standard. It's a European standard that
11 defines rupture as a situation where, you
12 know, the -- the -- the cell separates until
13 -- into two or more major components, but in
14 general, yeah, thermal runaway will result
15 in, you know, the -- the emission of -- of
16 -- of chemicals and materials that are
17 generated by the thermal runaway reaction
18 during -- during that process.

19 Q. And two of the six cells that
20 ruptured in this case, based on your
21 definition of "rupture," correct?

22 A. Two of the six cells exhibited a
23 rupture, which is the tearing of a steel
24 can, and -- and -- and the -- two of the six
25 cells exhibited a crimp release, which I

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1 would -- I would denote as a special
2 character -- a special rupture situation,
3 where the can doesn't tear or -- or, you
4 know, the can stays intact. It's the crimp
5 that unfolds and contents are ejected, yes.

6 Q. And the next sentence says, an
7 ignition of those flammable gases can lead
8 to a possible explosion or fire, correct?

9 A. That's correct.

10 Q. And then in the next paragraph,
11 it says, lithium battery thermal runaway can
12 be caused by exposure to excessive
13 temperatures, internal shorts due to cell
14 defects, external shorts due to faulty
15 wiring, a surge in the charging or
16 discharging current, or mechanical damage to
17 the cell that can lead to internal shorts
18 and heat generation.

19 Did I read that correctly?

20 A. You did, yes.

21 Q. And do you agree with that
22 statement?

23 A. I -- I agree with it in that it
24 -- it encompasses, you know, there are --
25 there are other situations that can cause a

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1 thermal runaway in a lithium ion battery,
2 but I agree with those, yes.

3 Q. Okay. And those would include
4 charging and overcharging, surging charging,
5 or over-temperature, correct?

6 A. Correct, yes. I mean, to just
7 -- to be -- to clarify, not every
8 overcharging situation is going to cause
9 thermal runaway. Not every surge charge
10 current is going to cause thermal runaway,
11 but -- but those things can depending on the
12 severity of -- of them.

13 They can -- they can in certain
14 situations result in that. Not always, but
15 they can, yes.

16 Q. Now, going back to your report,
17 which is Tab 1, Exhibit 1, and if you turn
18 to Page 5.

19 A. Give me just a second. I -- I
20 got to go to the beginning of your binder.
21 That was at the very end. So give me just a
22 second, get back to that. I feel like I'm
23 going from the yellow pages to the white
24 pages in the phonebook. I guess that maybe
25 dates me.

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1 Page -- page number again, I'm
2 sorry?

3 Q. Page 5.

4 A. Okay.

5 Q. And you have -- in the beginning
6 of your report, after you do your
7 qualifications, you -- you provided your two
8 opinions and they're going to be discussed
9 more in the body of the report and then
10 summarized at the end, correct?

11 A. Yes.

12 Q. But the first opinion was that
13 the -- the battery pack of the alleged
14 subject HP Pavilion DV6 Notebook Computer
15 was inconsistent with the genuine original
16 battery pack that would have been sold with
17 this HP model.

18 That's your opinion, correct?

19 A. Yes.

20 Q. And then the second sentence
21 says, as such, protections provided by the
22 original pack may not have been present in
23 the battery pack that was installed in the
24 notebook at the time of the fire, which
25 could have led to degradation of the

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1 performance and safety characteristics of
2 the cells.

3 Did I read that correct?

4 A. Yes.

5 Q. So that -- that combined, is
6 your first opinion, those two sentences that
7 I read?

8 A. Correct, yes.

9 Q. Okay. Now, if you could turn to
10 Tab 15 that I marked as Exhibit 3, and this
11 is a Texas Instruments Application Report
12 from 2005.

13 (Exhibit 3, Texas Instruments
14 Application Report, was received and
15 marked for identification by the
16 reporter.)

17 Is this a document that you
18 reviewed in preparation for your
19 testimony today?

20 A. Yes, it is.

21 Q. And this is a -- Texas
22 Instruments is one of the -- the leading
23 chipmakers that provides parts to the
24 computer industry, correct?

25 A. Yes, it is.

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1 Q. And specifically, Texas
2 Instrument [sic] makes a microprocessor
3 called a fuel gauge that is frequently
4 incorporated into battery management
5 systems?

6 A. Yeah. Again, I'm -- I'm not an
7 electrical engineer, but -- so I'm going to
8 just qualify that, but my understanding is
9 that, yes, Texas Instrument [sic] chip sets,
10 you know, a fuel gauge, can be incorporated
11 in -- into -- what is generated, called a
12 fuel gauge can be incorporated into the --
13 into the chip or the design of the circuit.
14 That's my understanding.

15 Q. Well, you -- you have some
16 familiarity with battery management systems,
17 correct?

18 A. I have familiarity with them
19 with respect to, you know, what is generally
20 -- or what can generally be used in -- in a
21 battery management system, yes.

22 Q. And -- and battery management
23 systems almost universally have fuel gauges.
24 The reason they're called fuel gauges is one
25 of the functions of that microprocessor is

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1 to keep track of how -- what the state of
2 charge of the battery pack is, correct?

3 A. There -- my understanding of the
4 term "fuel gauge" is that it is -- again,
5 one of these terms of art that can mean many
6 different things. In general, my
7 understanding is that it provides some sort
8 of -- at -- at a minimum, some sort of an
9 indication of the charge of the battery.

10 How it does it, the level of
11 sophistication that is involved, whether
12 it's simply looking at the voltage of the
13 battery, either unloaded or loaded, or if
14 it's doing what's called coulomb counting,
15 things of that nature, or other
16 more-sophisticated techniques, you know, is,
17 you know, that -- that all goes into.

18 Again, not my area of expertise.
19 I've never designed a fuel gauge system, nor
20 have I tested fuel gauge systems in -- in
21 battery packs, but that's my general
22 understanding, is it is an attempt for -- of
23 the electronics to determine and report --
24 be able to report the -- the user of the
25 device, you know, an -- an estimate of what

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1 the battery -- how much longer the battery
2 will last under a given operating load.

3 Q. And again, this may be beyond
4 your expertise, but -- but the fuel gauges
5 that were made by Texas Instruments also
6 provided a number of the safety systems that
7 are required for lithium ion battery
8 protection, such as protection against
9 overcharge, protection against overvoltage,
10 protection against over-temperature and cell
11 balancing.

12 Is that your understanding or is
13 that beyond your expertise?

14 A. Again, I don't -- this is a 2005
15 document, so it's 25 [sic] years ago. If
16 you're asking me what Texas Instruments was
17 doing with their -- with their chip sets
18 back in 2005 as far as, you know, I don't
19 know if it's a single chip that's doing all
20 of this or if it's a -- if it's a chip set
21 that's doing it.

22 I -- I -- I, you know, but --
23 but my understanding is that Texas
24 Instruments, even back in 2005, was -- was
25 designing chip sets and chips for -- for

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1 battery management systems.

2 Q. And you said that in -- in your
3 first opinion that I read, and -- and you
4 can look back at it if you need to, but you
5 said that the -- the fact that this was an
6 unauthorized battery pack may mean that it
7 -- it lacked certain safety systems that a
8 normal battery pack would have?

9 A. It --

10 MS. WANEMAKER: Object to form.
11 You can answer.

12 A. Let's -- let's -- let's just
13 make sure that we go back to -- to that.

14 Q. Sure. On Page 5.

15 A. Yep.

16 Q. Tab 1.

17 A. I'm going -- I'm going to keep
18 my finger in Tab 15, so I can get back to
19 that one quicker. So what I -- what I said
20 is, in -- in --in the Primary Opinion No. 1,
21 such protections provided by the original
22 pack may not have been present in the
23 battery pack that was installed in the
24 notebook at the time of the fire, which
25 could have led to degradation of the

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1 performance and safety characteristics of
2 the cells.

3 Q. Right. So that's what I was
4 asking you is, that what you're referring to
5 there, are some of the safety systems that
6 I've described, such as cell balance,
7 overcharge, protection -- overvoltage
8 protection, over-temperature protection,
9 correct?

10 A. Those are not all necessarily
11 safety systems, but those would be systems
12 that may not be employed by the -- by the
13 instant battery pack.

14 Q. So you don't -- which ones that
15 I just described would you say are not
16 protection against those -- those states,
17 overcharge, over-temperature, overvoltage,
18 or cell imbalance? Which of those would not
19 be safety systems in your view?

20 A. So cell imbalance is not
21 necessarily a safety issue as long as
22 individual, you know, cells or cell blocks
23 are -- are not overcharged. In fact, many
24 battery packs don't employ a balancing
25 system, because a balancing system can

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1 actually be a negative with respect to -- to
2 safety.

3 Think of it in -- in this way:
4 If you happen to have a defective cell --

5 Q. Well, actually, I'll stop you.
6 If -- if -- if -- if you're saying that cell
7 balance is one that you would not include as
8 a safety system, that's really the answer to
9 the question.

10 A. Not -- not necessarily. Again,
11 the devil's in the details, but that's --
12 that's -- that's -- that's one, and again,
13 overcharge protection, you know, again,
14 where's the overcharge, are we talking about
15 overcharge, are we talking about
16 over-current, but that -- that -- that, you
17 know, if we're talking about over --
18 overcharging to too high of a voltage, that
19 -- that -- that can certainly make a battery
20 more susceptible to exposure to high
21 temperatures, sure.

22 Q. Okay. So that's the only thing
23 that you worry about with overcharge, not
24 that that could, by itself, put a system
25 into thermal runaway, overcharge

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1 exclusively, is a danger only if there's
2 external temperature exposure; is that your
3 opinion?

4 MS. WANEMAKER: Objection to the
5 form of the question.

6 You can answer.

7 A. It's not a blanket opinion,
8 because we -- again, we -- we have to focus
9 on the cells at issue in this case, which
10 are 18650 lithium ion cells. If we are
11 talking about pouch cells or prismatic
12 cells, overcharging is -- is -- is really
13 crucial on -- on the safety aspects of those
14 cells, because they do not have current
15 interruptive devices that are incorporated
16 into the vent design in those form factors.

17 18650 cells do have current
18 interruptive devices that are incorporated
19 into the vent. So when you overcharge an
20 18650 lithium ion -- when you overcharge any
21 lithium ion cell, you generate gas pressure,
22 you generate gas inside the cell, and when
23 that pressure gets to a certain level in an
24 18650 cell, the CID or the current interrupt
25 device will operate, will activate.

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1 As described in my report,
2 there's a section of CIDs, and it -- and it
3 does -- it does -- that section specifically
4 states that it's a protection against
5 overcharging. It's extremely effective,
6 because when it activates, it's not a
7 reversible activation. It actually
8 activates permanently.

9 So it prevents the cell from
10 being overcharged beyond the state where it
11 will activate the vent. When I say it
12 activates the vent, it activates the vent
13 long before you get to the point where you
14 even have -- you even hit the onset
15 temperature. So it activates the vent by
16 design in Stage 1.

17 So when you're talking about
18 overcharge of a battery system that employs
19 18650 cells, which have inherently a current
20 interrupt device incorporated into the vent
21 assembly, then overcharging is -- is really
22 not an issue with -- with those cells.

23 Especially when we're talking
24 about, you know, slight repeated
25 overcharging, like, what you might have in a

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1 pack like this, you know, in -- in -- in the
2 instant pack. If it's a pouch cell or if
3 it's a prismatic cell, then overcharging is
4 a serious issue, because you don't have the
5 cell level protection against overcharging.

6 So 18650s are sort of, I guess
7 you could say, maybe a special case or at
8 least the, you know, a case where
9 overcharging is not really a significant
10 problem from a safety perspective.

11 Q. Okay. And that's universal, all
12 18650 cells, none of them have really a
13 danger of overcharge causing a fire?

14 A. Not overcharging in, like, what
15 would be capable in a battery pack in a
16 notebook computer, correct.

17 Q. Okay. So -- okay. I just want
18 to make sure I'm clear.

19 So in your opinion, there's not
20 really any safety aspect of overcharging an
21 860 -- 18650 battery because of this inherit
22 design within it that would prevent any --
23 any danger of fire from overcharge?

24 A. Correct, and, you know, and I
25 base it on, you know, hundreds and hundreds

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1 of testing -- tests that -- that -- that
2 we've done at Exponent on overcharging 18650
3 cells.

4 It's -- unfortunately, it's --
5 from an experimental standpoint, it's --
6 it's -- it's really problematic, because you
7 really like to get the cell to have a
8 thermal event by overcharging for various
9 different things that you might be trying to
10 measure from, you know, from a thermal
11 runaway event, but the CID activates before
12 you get to that point.

13 So generally, when we're looking
14 at studying the effects of overcharge on
15 safety of 18650 cells, we're looking --
16 doing pouch cells and -- and -- and/or
17 prismatic cells. What we --

18 Q. Do you have any -- any
19 literature references that support your
20 opinion that 18650 cells do not have any
21 overcharge safety dangers associated with
22 them?

23 A. I mean, I guess what I would do
24 is, I -- I would initially point to you --
25 to the -- point to the standards, because

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1 the standards --

2 Q. I mean -- I'm talking about
3 specific statements that 18650 batteries --
4 battery cells are not going to go into
5 thermal runaway from overcharge because of
6 this system that you say is a fail-safe
7 system that will prevent that.

8 Do you have a reference for
9 that?

10 MS. WANEMAKER: Object to the
11 form.

12 You can answer.

13 A. Again, you know, where -- where
14 I would point you to -- off the top of my
15 head, I -- I can't -- I can't come up with a
16 specific reference for you, but I would
17 point you to the -- the -- all the
18 international and national standards, which
19 all subject 18650 cells to an overcharge
20 situation, and then require that those cells
21 do not have any kind of a thermal -- thermal
22 event or -- or fire or explosion.

23 The same is true for
24 overdischarge, which also generates
25 excessive gas. Again, the CID, the vent

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1 mechanism is extremely resilient from a
2 standpoint -- from a -- from a safety
3 perspective. There are ways you can bypass
4 that, but -- but generally, when we're
5 talking about, you know, limited charge
6 capability of the -- of the computer to, you
7 know, charging rate and -- and things of
8 that nature in the computer environment
9 itself, then yeah.

10 It's -- overcharging and
11 over-discharging on 18650 batteries is -- is
12 not a -- a safety issue. It is certainly a
13 performance issue, and it's a safety issue
14 if you're talking about exposure to elevated
15 temperatures, because an overcharged cell,
16 even if the CID has activated, is going to
17 have a lower, you know, slightly lower onset
18 temperature and will be maybe more
19 susceptible or more reactive when exposed so
20 external heat.

21 So it is going to make the cell
22 less resilient from a heat -- external heat
23 exposure standpoint, but the safety
24 mechanism is incredibly robust with respect
25 to these -- these events causing the cell to

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1 have a thermal event assuming that --
2 assuming that you're -- assuming that you're
3 operating the cell within its designed
4 specifications.

5 Q. Okay. And so for 18650 cells
6 then, they don't view overcharge,
7 over-temperature protections as safety
8 features, because these cells can't go into
9 thermal runaway for any of those conditions
10 other than from external heat source?

11 A. Assuming that you're operating
12 the cell under, you know, in -- within its
13 nominal specifications, you know, charge,
14 you know, charge rate specifications, its
15 nominal temperature, you know,
16 specifications, you're not exposing it to
17 external heat, then that is correct.

18 Q. So this exhibit that we marked,
19 which I've marked as Exhibit 3, Tab 15, the
20 Texas Instrument, he talks about -- the
21 first paragraph talks about multiple devices
22 now that are powered by these -- these
23 batteries and that this has opened a huge
24 market for counterfeiters to supply cheap
25 replacement batteries and peripherals, which

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1 may not have the safety and protection
2 circuits required by the original equipment
3 manufacturer; do you see that?

4 A. This is the first paragraph on
5 Page 1 of the Texas Instrument Application
6 Report from 2005?

7 Q. Under "Abstract," yes.

8 A. Yes, I see.

9 Q. And is this -- is that something
10 that you were aware of in 2005 then, that --
11 that counterfeit battery packs were being
12 sold below the -- the -- the cost of
13 authorized replacement battery packs and
14 that some of the manufacturers of those
15 counterfeit battery packs were skipping the
16 safety devices?

17 MS. WANEMAKER: Object to the
18 form.

19 You can answer.

20 A. Yeah. It -- it was not seen at
21 the time as -- as -- as a significant issue
22 in the industry, as -- as -- as I -- as I
23 recall in that -- in the 2005 timeframe.

24 Q. Now, Texas Instruments was
25 reporting on it, but you're saying it wasn't

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1 a big deal?

2 A. Well, I mean, you're -- what --
3 this document is -- is a marketing report,
4 right? Texas Instrument is trying to
5 convince people to purchase their -- their
6 -- their product, right? So -- but yeah.

7 I -- I as -- as a battery expert
8 back in 2005, and I was definitely in the
9 battery industry back -- back in that
10 timeframe, and doing battery failure
11 analysis, was not aware of counterfeit
12 batteries in devices as being a significant
13 issue, you know, so --

14 Q. So at some point after that,
15 Mr. Atkinson testified that he became aware
16 of it at HP, though, right?

17 A. I believe he -- in, you know,
18 around -- as -- as I recall, again, I may
19 have the year -- I may be off by a year or
20 two, but I believe in the late 2000 teens,
21 around maybe 2017, 2018, some -- some -- in
22 that timeframe. Yes, it started to become
23 more of an issue.

24 There -- there are industry
25 reasons for why it wasn't a big issue back

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1 around the 2005, early, mid, early to mid
2 2000, you know, 2000, 2010 timeframe, why
3 things started to get a bit more of a
4 concern in the late 2000 teens, but that's
5 -- I believe that what Atkinson was saying,
6 was that, yeah, HP began to see that as
7 becoming an issue in the late 2000 teens.

8 Q. And you didn't read Mr. Pipho's
9 deposition, you said, right?

10 A. I -- I don't think I did, no.

11 Q. Okay. So it surprises you to
12 say that he know about it in the early 2000
13 teens, that would be a surprising statement
14 to you?

15 A. I -- I -- I have a -- I -- I
16 would -- questions like that, if you have
17 something that you would like me to read
18 from his deposition, I would be happy to do
19 it and comment it -- comment on it, but I
20 would want to read it in context.

21 Q. Sure. Well, I thought you were
22 saying, universally, no one in the industry
23 knew about a -- a wide-spread danger of
24 counterfeit battery packs that lacked safety
25 features until the late 2000 teens, and I

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1 just was asking you if -- if Mr. Pipho had
2 disagreed with that, would that surprise
3 you, and you're saying you would have to
4 read Mr. Pipho's deposition to know whether
5 it surprised you or not?

6 MS. WANEMAKER: Object to the
7 form.

8 You can answer.

9 A. Counselor, I believe you
10 misrepresent my testimony. I did not
11 testify that nobody in the industry was
12 aware of anything in the early 2000 teens.

13 In fact, we can have the court
14 reporter go back and -- and -- and reread my
15 testimony on that just so that we're clear.

16 Q. Okay. So in 2005, some people
17 in the industry were aware of this problem,
18 because Texas Instrument printed it in this
19 article, correct? Do you agree with that?

20 A. No, I do not. I would -- what I
21 would agree with is that Texas Instruments
22 decided that they had a product that they
23 wanted to sell to the industry, and that
24 this is a marketing report, the marketing
25 paper that says that, hey, look, if you've

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1 got that problem, if you see that there's a
2 problem here, we may have a solution for
3 this problem. Again, it's not a
4 peer-reviewed paper, it's a marketing white
5 paper.

6 Q. Okay. So in your view, was
7 Texas Instrument inventing a problem so they
8 could sell a device; is that what you're
9 saying?

10 A. What I'm saying is that I was
11 certainly not aware of a significant problem
12 in the industry in the 2000, 2010 timeframe
13 with respect to counterfeit and/or
14 counterfeit batteries in consumer product
15 applications.

16 Q. And you only learned of that
17 later?

18 A. It become -- it became more of
19 an issue in the mid to late 2000 teens,
20 certainly.

21 Q. Okay. But you certainly were
22 aware of it by 2020?

23 A. Yes, yes.

24 Q. So when Texas Instruments' paper
25 is indicating that the counterfeit battery

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1 packs may not include certain safety
2 devices, are those the same types of safety
3 devices you're referring to in your Opinion
4 No. 1 that may be lacking in counterfeit
5 battery packs?

6 A. I -- I would imagine that they
7 would be -- that some of those would be.

8 Q. Okay. So if you would turn to
9 Tab 7, which I've marked as Exhibit 4, and
10 this is, I think, the document that was
11 included in your list of materials that you
12 reviewed.

13 (Exhibit 4, Tab 7, was received
14 and marked for identification by the
15 reporter.)

16 A. Let me go back to my list of
17 materials, just to make sure that this is
18 indeed the -- the same document. So bear
19 with me.

20 Q. It -- it starts with HP01378,
21 which are the documents that were produced
22 by HP in this case, but certainly, take your
23 time.

24 A. Which items specifically on the
25 "Materials Reviewed" are you referring to?

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1 Q. The production of HP documents,
2 I think is what it's described as. HP
3 production documents.

4 A. Okay. Okay. I mean, I -- so
5 for -- for -- for -- for the record, I mean,
6 that was a large number of documents, you've
7 got a specific document here. I'm happy to,
8 you know, just answer questions about this
9 if you have specific questions.

10 I -- again, you know, it may or
11 may not have been in that production that I
12 looked at. Obviously, I haven't admitted
13 the entire production to -- to -- to memory.
14 So I -- I can't say as I sit here if this is
15 exactly the same document.

16 Q. All right. Let me ask you this:
17 In the generic sense, did you review any HP
18 specification for the authorized battery
19 pack for this type of laptop that was
20 involved in this fire?

21 A. Yes, I -- yes, I did.

22 Q. Okay. And if you look at this,
23 does this appear to be -- first of all, it's
24 got an HP production number on the bottom,
25 so it was produced by HP to us in this case,

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1 involving a Pavilion laptop, and
2 representing to us -- represented to us,
3 that this is the specification for the
4 six-cell battery specification for this
5 particular laptop.

6 Do you have any reason to
7 disagree with that?

8 A. I -- I do not, and I -- for --
9 for the purposes of any questions that you
10 have for me, I will assume that I -- that
11 this is the spec for the -- for the battery
12 pack for the instant laptop and that I have
13 looked at this.

14 Q. Okay. And would you agree with
15 me that -- the spec for the battery pack
16 that was authorized for the laptop would be
17 an important piece of information in
18 analyzing this case?

19 A. Yes.

20 Q. Okay. So you just don't
21 recognize whether it was this particular
22 specification, but you do remember looking
23 at a specification in the production
24 documents that HP provided for this laptop?

25 A. Correct. And, you know, I, you

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1 know, and I don't -- I don't mean to be, you
2 know, causing trouble. I mean -- but, you
3 know, just for -- for the record, I mean,
4 this does say "Revision 1.3."

5 I -- I don't know, for example,
6 if I looked at Revision 1.3, or Revision
7 1.1, or Revision 1.5, if that exists. I'm
8 -- all I'm saying is that I looked at a
9 specification. I just can't tell you as I
10 sit here if this -- if this is the -- the --
11 indeed the specific document that -- that I
12 looked at.

13 Q. Okay.

14 A. That's all I'm saying.

15 Q. Understood, understood. Okay.
16 So just as a general sense, this
17 specification of whatever one you looked at,
18 would be the document where HP produces a --
19 a set of specifications for vendors that
20 might build batteries for them, and these
21 are the requirements that that vendor would
22 have to meet to get their battery pack
23 authorized; is that a fair summary?

24 A. That's my understanding, yes.

25 Q. Okay. So if we look at this --

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1 and I think you said that for -- for 18650
2 batteries, the electrical protections like
3 overcharge, overdischarge, overvoltage,
4 over-temperature, those are all basically
5 more for battery performance than for
6 safety, right?

7 MS. WANEMAKER: Objection to the
8 form.

9 Q. I think that was your testimony.

10 A. Again, you -- I -- I do want to
11 emphasize that, you know, things like
12 repeated overcharging can cause leakage of
13 the battery, right? The venting and leakage
14 of the battery. That's not something we
15 want and that can -- that can have safety
16 implications.

17 Especially if the electrolyte,
18 you know, gets on the board or it's -- if
19 the electrolyte is flammable, so if it's
20 exposed to a, you know, a flame or an
21 ignition source, it can also -- those types
22 of things, overcharge, overdischarge, things
23 like that, can make the batteries more
24 susceptible to, you know, external heat.

25 So if you're exposing the

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1 battery to, you know, excessively high
2 heats, if you're leaving your notebook
3 computer, you know, on the dashboard of your
4 car in Phoenix in the middle of the summer
5 in the sunshine, right?

6 Things of that nature, you know,
7 it can make the, you know, the battery less
8 robust than what was initially designed from
9 a safety perspective from, you know,
10 exposure to, you know, misuse, abuse, you
11 know, thing -- things of that nature, but in
12 general, it's -- it's -- it's -- for 18650
13 cells, it's -- it's performance.

14 It's, you know, it's, you know,
15 you don't want those CIDs to activate,
16 because basically, the pack shuts down and
17 the -- the consumer can't use the battery at
18 that point. So it's generally a performance
19 issue when it comes to -- for 18650 cells.

20 Q. Okay. So just so we're clear,
21 this specification is directed to 18650
22 battery packs, correct?

23 A. Well, the six-cell battery
24 specification for this pack would -- would
25 be for 18650s, yes.

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1 Q. Okay. So we're talking about
2 18650 batteries, so the specifications here
3 would apply to 18650 batteries, correct?

4 A. Correct, yes.

5 Q. And -- and again, when we're
6 talking about batteries, we're talking about
7 battery packs, not -- not just cells, 18650
8 cells in a battery pack device?

9 A. Correct.

10 Q. Okay. So again, HP sets up
11 these parameters that the vendors have to
12 meet, and first of all, if it specifies
13 certain fuel gauges that are required and --
14 and they have to use one of these -- these
15 approved fuel gauges in the battery
16 management system; is that how you interpret
17 this?

18 A. Yes.

19 Q. And six of the eight fuel gauges
20 that are approved for use in the battery
21 management system for this particular laptop
22 were from HP, correct?

23 A. Incorrect. They're from Texas
24 Instruments.

25 Q. I'm sorry, from Texas

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1 Instruments. That was a misstatement.

2 Six of eight are from Texas

3 Instruments?

4 A. Correct.

5 Q. And Texas Instruments is the
6 same company that you said was -- put out
7 that 2005 propaganda piece to try to sell
8 additional devices to -- to manufacturers?

9 A. Counselor, again, I did not say
10 the "propaganda piece." I said that was --

11 Q. Marketing.

12 A. I said it was -- I said it was
13 marketing material. If we -- if we could
14 stick to --

15 Q. Okay.

16 A. -- you know, actually --

17 Q. So --

18 A. -- what I say factually, I would
19 -- I would greatly appreciate it.

20 Q. But the implication you drew is
21 that HP was trying to raise concerns that
22 you felt were unnecessary in order to sell
23 something?

24 MS. WANEMAKER: Objection to the
25 form.

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1 You can answer.

2 A. I -- I never said HP was trying
3 to raise concerns of --

4 Q. I'm sorry. Texas Instruments
5 was trying to raise potential safety
6 concerns about counterfeit battery packs, so
7 that they could sell authentication systems.
8 Was that your opinion of what that marketing
9 piece was about?

10 A. I never said that there were
11 unfounded concerns. There may be certain
12 industries where they -- where that was
13 important. I mean, that -- that's -- I
14 mean -- but it -- it is marketing.

15 So Texas Instruments designed
16 something, they see that -- TI might see
17 that there's -- there's -- there could be a
18 potential problem and they -- they design
19 something and then they market it. I mean,
20 that's -- that's what -- that's what
21 companies do, right?

22 They try to get out in front of
23 it, you know, whether or not the, you know,
24 different potential customers see that as a
25 problem or are detected as a problem, that

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1 -- that's another thing, right? So all I'm
2 saying is that it is a marketing piece, it
3 is a white paper. It is not peer-reviewed.
4 It's Texas Instruments' take on it.

5 They clearly want to sell their
6 product back in 2005 and -- but HP has
7 testified and -- and I'm testifying today
8 that back in 2005, you know, from a consumer
9 electronic standpoint, this was not the --
10 the big issue with respect to battery
11 failures.

12 Q. So then this specification has a
13 number of subparts, and one of them is
14 "Safety Functions," and -- and that's --
15 what it's called, right, "Safety Functions"?

16 A. You're --

17 Q. 2.5.

18 A. 2.6, I believe.

19 Q. What HP calls as safety
20 functions, correct?

21 A. Section 2.6 is titled "Safety
22 Functions" in the document, yes.

23 Q. And the document says, under
24 "Safety Functions," the battery pack shall
25 be built with the following safety

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1 protection functions and then it lists,
2 overcharge, discharge, over-current,
3 over-temperature, reverse charge, cell
4 imbalance, and short circuit protection.

5 That's what it says, correct?

6 A. Correct.

7 Q. Now, you -- I believe it's your
8 opinion that none of those are really
9 safety-related functions for 18650, because
10 they -- those conditions aren't capable of
11 causing fires or explosions other than in
12 very limited circumstances, correct?

13 MS. WANEMAKER: Object to the
14 form.

15 You can answer.

16 A. Yeah. So Counselor, notice that
17 there is not a section that is performance
18 functions. Generally, when we're -- when
19 people are -- when specifications are made
20 for battery packs, those specific issues,
21 you know, the -- that are listed here, are
22 put under the category of -- of -- of safety
23 functions.

24 Again, because there isn't --
25 you'll notice the absence of a section in

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1 here, the equivalent section that is
2 performance functions. Your specific
3 question, which was none of those, are --
4 are -- are safety functions.

5 I will go back to my original
6 answer and say that, look, you know, a -- a
7 cell that has had an overcharge event that
8 has activated the CID is going to be less
9 thermally stable when exposed to an external
10 heat attack. It will certainly have leaked
11 electrolyte.

12 There -- there are potential
13 issues with that under the right conditions
14 where that can be a safety issue, right?
15 You know, if -- if you're using the -- the
16 device in, you know, areas where, you know,
17 it could be exposed to, you know, an
18 ignition source or it could be exposed to
19 extreme elevated temperatures and you don't
20 want that, right?

21 So -- but those are -- those are
22 -- generally, those are -- those are
23 features that would be, you know, put into a
24 section called safety functions. Again,
25 because there is an absence of a section

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1 called performance enhancement, performance
2 retention, or something like that functions
3 in the specifications. That's generally
4 where you expect it to be.

5 Q. And is that something that
6 you're familiar with from creating
7 specifications for battery packs, that you
8 use the word "safety" when you mean
9 performance?

10 A. It's something that I'm familiar
11 with, because I reviewed hundreds of battery
12 pack specifications for a variety of
13 different applications over the last
14 25 years.

15 Q. And over that 25-year period,
16 these different devices are universally
17 referred to as safety functions?

18 A. I would not necessarily say
19 universally, because I think in things like
20 electrical vehicles and other, you know,
21 other, you know, very large battery packs,
22 there are more detailed and sophisticated
23 sections regarding performance, you know,
24 where, you know, when you're spending, you
25 know, a tremendous amount of money on a

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1 battery pack and you want to make sure that
2 it lasts for ten, 15 years, you know, you
3 are very concerned, because, you know, the
4 pack is extremely -- a pack is -- might be
5 tens, or 20, or even hundreds of thousands
6 of dollars, you know, performance and
7 longevity is a -- is a very important part.

8 So you will have sections in
9 those specifications for that, but with
10 respect to consumer electronics, this is
11 very standard.

12 Q. Right. So in your experience,
13 all the 18650 specifications you've ever
14 read, refers to these particular functions
15 as safety functions, that's -- that's the
16 parlance you've seen?

17 A. This is consistent with what I
18 am familiar with, yes.

19 Q. Okay. And the -- 2.5 also says
20 that the battery pack needs to have
21 temperature sense capability; do you see
22 that?

23 A. Yes.

24 Q. And temperature sense capability
25 in this context means -- and we can look at

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1 the specification later on here, that when a
2 temperature of the battery pack gets above a
3 certain level, the charge has to be turned
4 off.

5 Are you familiar with that?

6 A. Generally, that is one of the --
7 one of the features of the temperature
8 sensing, yes.

9 Q. And is it your opinion that that
10 is entirely for performance only and not for
11 safety?

12 MS. WANEMAKER: Object to the
13 form.

14 You can answer.

15 A. There -- there -- there is a
16 safety function of that. Again, you know,
17 if -- so you're -- the -- again, I'm going
18 to go back to the, you know, your car in the
19 summertime.

20 It is very foreseeable that
21 somebody may leave their electronic device
22 in their car in the summertime, and it is
23 very conceivable that the temperature of
24 that car could get above 65 degrees Celsius
25 in the summertime if it's parked in the sun.

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1 You don't want to be charging your battery
2 at 65 degrees Celsius, or 45 degrees
3 Celsius, or 50 degrees Celsius under those
4 conditions, right, and there are certainly
5 car chargers and there are many other, you
6 know, scenarios you can think of where the
7 device could be at elevated temperature and
8 you don't want to be charging, you know,
9 putting charge into it for -- for -- for
10 safety reasons.

11 So yeah. I mean, that can be
12 under those -- in those situations, where
13 you're -- the device is in a high
14 temperature ambient condition, you don't
15 want to be charging it, and there are safety
16 reasons for this.

17 Q. Okay. What's -- what's the
18 danger of a battery that is over 45 degrees
19 Celsius that continues to charge, what's --
20 what's the safety risk there?

21 A. Generally -- and again, there --
22 there's -- there's, you know, there is a,
23 you know, a safety margin there, but when
24 you charge a battery, the battery does heat
25 up due to -- because of the internal

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1 resistance of the battery. It's, you know,
2 what we generally refer to as ACIR heating.
3 So the battery is going to heat up.

4 So if it's already at an
5 elevated ambient temperature, right, and
6 then you're heating the battery up, because
7 you're charging it, you want to stay below
8 that onset temperature, right? So that's
9 the --

10 Q. The onset of thermal runaway?

11 A. No. The onset of -- the onset
12 of self-heating of the battery, right? You
13 want to make sure -- you want to try to stay
14 below that. So that's -- that's the issue.

15 Q. The onset temperature you're
16 talking about is the temperature where the
17 -- the battery creates more heat
18 spontaneously by itself. That's the onset
19 temperature you're talking about, right?

20 A. The onset temperature is
21 beginning of Stage 2 in the -- in -- was it
22 the Yuan paper that I believe you pointed
23 to --

24 Q. Sorensen.

25 A. Was it Sorensen? Sorry, my --

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1 my apologies.

2 Q. That's okay.

3 A. Yeah. That's the transition
4 from Stage 1 to Stage 2. That's the onset
5 temperature.

6 Q. And so --

7 A. You want to stay below that.

8 Q. Right. So this temperature
9 sense capability is intended to keep the
10 battery pack from -- regardless of what
11 caused the -- the heat to increase beyond
12 that temperature, you want to make sure that
13 the charge is turned off when it reaches a
14 certain temperature, so that more energy
15 isn't put into the battery that can then
16 provoke it to the next phase?

17 A. Generally, that is correct, yes.

18 Q. And that would be considered a
19 safety device, correct?

20 A. In that -- in -- in that
21 instance, yes. That -- that is
22 predominantly there. I mean, it's there for
23 performance and safety, because when you get
24 the battery up to 45, 50, 55 degrees
25 Celsius, you will be permanently degrading

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1 the performance of the battery as well. So
2 there's a performance aspect of it, there's
3 a safety aspect of it, yes.

4 Q. And are you familiar with the
5 mechanism by which HP required the vendor
6 that makes the battery packs of -- of -- of
7 shutting down the charge?

8 A. The mechanism?

9 Q. In other words, so they want
10 this -- this battery management system to
11 shut off the charge when the temperature of
12 the battery pack gets above a certain
13 temperature, agreed?

14 A. Correct.

15 Q. Okay. Are you aware of how they
16 want it shut down, in other words, whether
17 it's a switch or whether it's a fuse?

18 A. I mean, I don't think it would
19 be -- I mean, my understanding of a fuse --
20 again, I'm not -- not -- not an electrical
21 engineer, but my understanding is that it
22 would be something like a FET or something
23 that would be resettable or -- yeah. I -- I
24 would just want to say, I -- I don't know.

25 It -- it measures the

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1 temperature. If the temperature gets above
2 a certain part, some magic happens in the
3 battery pack and -- and it stops charging
4 the battery. Exactly what that electronic
5 mechanism is --

6 Q. Okay.

7 A. Not my -- not my bailiwick,
8 Counselor.

9 Q. And have you looked at the
10 specifications for any of the fuel gauges
11 that HP specified that could be used in this
12 device?

13 A. No, I have not.

14 Q. So are you familiar that -- that
15 both HP specification and the fuel gauges
16 have two different devices, one a FET and
17 another, a fuse, as a fail-safe, so that if
18 the -- if the battery pack does not shut
19 down, a fuse blows that basically disables
20 the battery pack permanently, were you aware
21 of that?

22 A. In -- in general, certainly
23 since 2011, the IEEE standards have
24 recommended that you have, you know, a -- a
25 you have to have a -- you can't have a

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1 single-point failure, you have to have, you
2 know, a multipoint failure in -- in the
3 system. So having -- essentially having
4 redundancy in the safety protection
5 circuits.

6 I believe that's in the most
7 recent addition, I think it's 2011 of IEEE
8 1625 if I -- if I recall correctly. Exactly
9 how that's implemented, how the redundancy
10 is implemented, again, not my bailiwick,
11 Counselor.

12 Q. Okay. But if it's a fuse and it
13 permanently disables the battery pack so it
14 can never be used again, that would be --
15 that would be a safety device in all
16 circumstances, right? It wouldn't be to
17 protect the battery pack, because you're
18 disabling the battery pack?

19 A. I -- I -- I don't -- I'm sorry,
20 I didn't follow you.

21 MS. WANEMAKER: I didn't either.

22 Can you rephrase?

23 MR. SCHWARZ: Sure.

24 MS. WANEMAKER: Thank you.

25 Q. If the redundant system includes

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1 a fuse that gets blown that permanently
2 disables the battery pack so that it can't
3 be used again, that would be a safety
4 feature, not a performance feature; would
5 you agree with that?

6 MS. WANEMAKER: Object to the
7 form.

8 You can answer.

9 A. I mean, it's -- it's kind of
10 both, right? I mean, if the fuse blows,
11 then you're -- you're -- and you can't use
12 the battery anymore, you have a serious
13 performance issue. It's very similar to the
14 CID operating.

15 Once the CID operates in two
16 cells in the block, in this particular case,
17 the battery, that -- that is essentially a
18 fuse. The battery is disabled at that
19 point, because you've opened the circuit to
20 the siri strength [sic]. So yeah. I mean,
21 it's -- it's, you know, from the consumer
22 standpoint, from the customer standpoint,
23 from the user standpoint, it's a performance
24 issue.

25 From their standpoint, it's

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1 like, my battery pack won't take a charge,
2 my -- my computer won't run off my battery.
3 That's a performance issue, you know, it's
4 -- so I guess it's both.

5 Q. Okay. So I thought -- I thought
6 you defined a performance issue as ways of
7 preserving the performance of the battery
8 pack by keeping the -- whatever parameter
9 from getting to a point where it would
10 degrade the performance of the battery pack?

11 A. Yeah --

12 Q. And so you're saying that
13 something that would degrade the performance
14 100 percent and never allow it to be used
15 again, would still be a performance and a
16 safety device, not a strictly safety device?

17 A. Well, yeah. If you're the -- if
18 you're the user and suddenly, your battery
19 pack stops working, you will perceive that
20 as a performance issue. That's the
21 customer's -- that's the user perception of
22 that, absolutely. Yeah.

23 Q. And you're saying that -- that's
24 what HP would call a performance issue as
25 well?

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1 MS. WANEMAKER: Object to the
2 form.

3 Q. HP -- HP was the author of this
4 document and they're the ones that listed
5 things as safety issues. So I just want to
6 get an understanding. You said what the
7 user would view as a performance issue.

8 Is it your position that HP will
9 view a blown fuse that disables the battery
10 pack as a performance issue and not a safety
11 issue?

12 A. I am not in a position to tell
13 you what HP thinks.

14 Q. Well, you interpret HP's
15 documents --

16 A. Counselor, I will -- I will tell
17 you this, however, I will tell you that I've
18 been involved with many situations with
19 consumer electronics where there is a lot of
20 thought put into exactly what temperature do
21 we activate the FET, do we blow the fuse.

22 We would like it, you know, in
23 some situations to be as low as possible,
24 gives us the biggest safety margin, but if
25 you make it too low and the fuse is going

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1 off, you know, too frequently at too low of
2 a temperature, then your user is going to be
3 highly upset about this, because they're
4 going to have to be replacing their battery
5 all the time. That's a performance issue
6 from the user standpoint.

7 If you make it too high, you
8 don't have enough safety margin. So there
9 is this in between, right, where you're
10 trying to -- you're trying to navigate that.
11 You -- you want the user experience to be
12 good, you want to make sure that from a
13 safety standpoint, that you got enough --
14 you got enough margin to vary there.

15 So it's in between. Exactly how
16 HP interprets that, you know, that's a
17 question for HP, Counselor.

18 Q. I was -- I was going by their
19 phraseology in their report -- or in their
20 specification, but if you think that there
21 -- HP would answer that question
22 differently, I -- I will exceed to that.

23 Would you turn to Tab 5, which
24 I've marked as Exhibit 5?

25 (Exhibit 5, Fire Department

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1 Report, was received and marked for
2 identification by the reporter.)

3 A. Okay. This would be
4 Bates-number HP00398; is that correct?

5 Q. Yes. That's the beginning of
6 it.

7 A. Yep.

8 Q. And it goes on -- if you could
9 turn to the page that is the narrative part,
10 which is HP00410.

11 A. 410. Okay.

12 Q. And this is the narrative report
13 of the fire investigators from the Allegany
14 County Fire Investigation Team that actually
15 went to the scene and looked for the cause
16 of the fire, correct?

17 A. This -- it appears to be, yeah
18 -- yes. So if I go to 408, the, you know,
19 two pages before, it's titled "Allegany
20 County Fire Service Fire Investigation Form
21 (short)," yes.

22 Q. And the next page says,
23 "Narrative," and then the next page
24 continues the narrative, correct?

25 A. Correct.

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1 Q. And it's signed by CFC Jeff
2 Luckey on 2-21-20?

3 A. Correct.

4 Q. And -- and this was one of the
5 documents that you listed as the -- as one
6 of the materials that you reviewed. So I
7 was just going to ask you quickly: I
8 thought that you had looked at this?

9 A. I -- I have looked at this.
10 Again, you know, several months ago in
11 preparation of my report, but yes, I looked
12 at this.

13 Q. And on the -- on Page 410,
14 you're aware that the fire investigators
15 from the Allegany County Fire Investigation
16 Team reached the final hypothesis that the
17 HP battery or battery components near the
18 battery caused the battery to overheat and
19 explode, sending sparks and flammable
20 material that ignited the lightweight
21 materials in the office area of the computer
22 cabinet or closet?

23 You're aware of that?

24 A. I am aware that that is what the
25 Allegany Fire Department determined, yes.

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1 Q. But in your opinion, that's
2 impossible?

3 A. In my opinion, they -- they --
4 they are wrong, yes.

5 Q. Right. And so -- and you
6 weren't ever at the scene, correct?

7 A. Correct.

8 Q. You've never looked at -- you
9 weren't at the inspection that they did of
10 FRT of the laptop, and its components, and
11 the battery, correct?

12 A. Correct.

13 MS. WANEMAKER: Object to the
14 form.

15
16 A. I -- I -- I -- I -- I've seen
17 photographs and -- and x-ray images of the
18 evidence.

19 Q. And you've never actually asked
20 to look at the evidence that was collected
21 from the fire, including the -- the HP
22 laptop that was involved in the fire?
23 You've never asked to look at that?

24 A. There -- there -- I -- I have
25 not for the simple reason that, you know,

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1 there's nothing that I could conceive of at
2 the time that I wrote my report that -- that
3 I would have needed to do.

4 I -- I think that the, you know,
5 the evidence exam was -- that -- from the
6 evidence -- at least from the opening
7 reports, from the -- from Plaintiff's
8 experts, you know, was -- was sufficient for
9 -- to render an opinion on.

10 Q. So the answer is, you never --
11 you never asked and you never looked at that
12 stuff, because you didn't think you needed
13 to?

14 A. That --

15 MS. WANEMAKER: Object to the
16 form.

17 You can answer.

18 A. Yeah. I -- there -- there was
19 nothing in addition that -- at the time that
20 I wrote my report that I would have wanted
21 to look at, correct.

22 Q. Okay. So let's turn back then
23 to your report -- and it's now 1:12, would
24 you like to take a quick break and -- and
25 eat something, and we'll come back at maybe

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1 1:30?

2 MR. SCHWARZ: Jackie?

3 MS. WANEMAKER: That's a good
4 idea. If -- if -- if that works for
5 you, Doctor.

6 THE WITNESS: That -- that's
7 fine.

8 MS. WANEMAKER: Okay.

9 MR. SCHWARZ: Okay. Let's go
10 off the record.

11 THE VIDEOGRAPHER: The time is
12 1:12 p.m., going off the record.

13 (An off-the-record discussion
14 was held at this time.)

15 THE VIDEOGRAPHER: The time is
16 1:30 p.m., and we're back on the
17 record.

18 Q. We were just looking at -- at
19 the Allegany fire investigator report and
20 the -- the hypothesis -- the final
21 hypothesis they reach, and my question was,
22 in the notes that you looked at from
23 Mr. Gorbett, the HP expert, did you find
24 anything that was contradictory to what the
25 Allegany Fire Department people reported in

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1 their narrative?

2 A. I --

3 MS. WANEMAKER: I'm just going
4 to make an objection to the form, but
5 you can answer if you're able.

6 A. I -- I -- I -- I don't -- I
7 don't recall, you know, again, you know,
8 the, you know, what I would say is that it's
9 -- it's, you know, it's not unusual for me
10 to disagree with a fire department's
11 initial, you know, assessment, you know, a
12 lot of the times, fire departments are, you
13 know, are looking at, you know, where --
14 where they see, you know, you know --

15 Q. I'm sorry, Doctor. The question
16 I asked you, in specific, is not why you
17 disagreed with the fire department, but
18 whether anything in Mr. Gorbett's notes that
19 you listed as one of the materials you
20 reviewed -- Mr. Gorbett was the HP fire
21 investigator on the scene, whether anything
22 of his notes were -- were inconsistent with
23 what you read in the narrative from the
24 Allegany Fire Department investigator?

25 A. I -- I -- I don't recall.

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1 Q. Do you remember how extensive
2 Mr. Gorbett's notes were that you reviewed,
3 like, whether it was one page, or ten pages,
4 or diagrams, or --

5 A. My recollection was what I
6 reviewed, photographs from Mr. Gorbett and
7 there -- I -- as I recall, there -- there --
8 there may have been some photographs of some
9 notes that he took during his scene
10 inspection and that was -- that was the
11 extent of it.

12 Q. Okay. But the photographs of
13 the notes, did you read the -- the notes
14 that were photographed or did you just look
15 at the photographs?

16 A. I mostly was looking at the
17 photographs and would focus on the -- the
18 notebook computer -- the instant notebook
19 computer issue, as well as the -- the
20 battery debris.

21 Q. Now, if you turn back to your
22 report which, is Exhibit 1, the last page,
23 you have a "Limitations" section?

24 A. Yes, I'm there.

25 Q. And the last sentence says, if

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1 new data becomes available or there are
2 perceived omissions on the statements in
3 this report regarding any aspect of those
4 conditions, we ask that they be brought to
5 our attention as soon as possible so that we
6 have the opportunity to fully address them.

7 Did I read that correctly?

8 A. Yes.

9 Q. And is that sort of a standard
10 ending limitation you put on all your
11 reports?

12 A. It is, yes.

13 Q. Okay. So since the date of --
14 that you issued this report, which I believe
15 was December of 2024, if I'm correct, yeah,
16 December 2, 2024. Since that time, have you
17 discovered new information that you wish to
18 make any alterations or corrections in any
19 of the facts that you've listed in this
20 report?

21 A. None of the facts that I've --
22 I've issued -- that I listed in the report.
23 I mean, certainly, there were some issues
24 that were brought up in the rebuttal reports
25 from, you know, especially with respect to

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1 Professor Martin that I have issue with and
2 disagree with, but I don't -- but none of
3 those would call me to change any of the
4 opinions in my report.

5 Q. And what I was really asking
6 about is, did your -- so there's nothing
7 that you learned factually since the report
8 was issued that's different than the -- the
9 facts you assumed to be true at the time you
10 wrote the report?

11 A. Correct.

12 Q. Okay. All right. Let's then
13 take a look at Page 13 of your report.
14 Let's start there.

15 A. Okay.

16 Q. So on Page 13, you begin to talk
17 about the inspections that occurred that you
18 didn't attend, correct?

19 A. Correct.

20 Q. And the first inspection was the
21 February 27, 2020 inspection, where
22 Mr. Gorbett on behalf of HP and all of these
23 other individuals went to the actual scene
24 of the fire, which was approximately a month
25 after the fire?

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1 A. That's my understanding, yes.

2 Q. And where did you get that
3 information; if you recall? From
4 Mr. Gorbett's notes?

5 A. I -- I don't recall. I -- I
6 believe that that was information that was
7 provided to me by -- from -- from counsel
8 for HP.

9 Q. So who was at the -- the
10 examination was provided to you, do you
11 think by the attorneys for HP?

12 A. Yes, and as well as the date of
13 the inspection. Yes.

14 Q. And so the -- there was a -- it
15 appears to be, there were investigators from
16 two -- different investigators from Farmers
17 Insurance, two investigators from Staples,
18 the two FRT technology investigators, and
19 the attorney from my office, and then
20 Mr. Gorbett of HP, who is with a company
21 called Fire Dynamics Analis -- Analysis,
22 excuse me, and then Mr. Luckey, who was the
23 author of the Allegany fire investigator
24 report.

25 All those people were on the

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1 scene there on February 20th according to
2 your report and the information you were
3 provided, correct?

4 A. Correct.

5 Q. And then below that -- oh, and
6 then -- it indicated also that a 3D
7 Matterport, M-A-T-T-E-R-P-O-R-T, scan was
8 created. Did you review that?

9 A. I did not.

10 Q. Okay. And then the -- the next
11 section indicates that on October 27, 2020,
12 a lab exam occurred and then you list all
13 the people that were at the lab exam,
14 correct?

15 A. Correct.

16 Q. And was it your understanding
17 that the lab exam was an examination of
18 materials that were removed from the scene
19 on February 27, 2020?

20 A. That was my understanding, yes.

21 Q. And what was your understanding
22 of how the -- the items that were chosen to
23 be examined in the laboratory were chosen?

24 A. My understanding was that there
25 were, you know, different items that were

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1 found in the -- what was assumed to be, or,
2 you know, the area of origin and that those
3 were the items that were identified in the
4 previous lab exam -- or in the previous
5 scene exam that should be examined in more
6 detail.

7 Q. And on behalf of HP then,
8 Mr. Galler was present for the lab exam of
9 the materials that were chosen by the group
10 that included Mr. Gorbett?

11 A. That's my understanding.

12 Q. Was there any -- any item that
13 you felt should have been examined in the
14 laboratory, but wasn't brought back to the
15 FRT based upon your review of the case?

16 A. At the time I wrote the report,
17 no.

18 Q. What about now?

19 A. There -- there was a -- it's
20 identified in Karasinski's rebuttal report,
21 you know, there's a photo that he claims is
22 a remnant of one of the batteries that was
23 collected from debris from the closet in the
24 office at the scene.

25 He -- he claims that that is a

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1 remnant of the -- of one of the cells that
2 expelled its contents that was found in the
3 closet and that that is what initiated the
4 fire, and I believe he says in his
5 deposition that that was a -- a full
6 electrode assembly from -- from one of the
7 cells.

8 That -- that -- that specific
9 piece of evidence, I don't believe was
10 examined, in the October 27, 2020
11 examination and seems like that may have
12 been a -- a critical piece of -- of evidence
13 that -- that -- that should have been
14 examined.

15 Especially if -- if that is what
16 -- he has claimed to have been from the
17 battery from the -- from a cell from the
18 instant computer that made its way to the
19 closet and initiated the fire in the closet.

20 Q. Okay. So you used the word
21 "claims" several times. Is it your -- is
22 your testimony that you don't believe that
23 any remnants of the battery interior cells
24 were found in the closet?

25 A. I certainly haven't seen any --

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1 any evidence that would -- that would
2 support that there were any -- any -- any
3 evidence of the batteries that were found in
4 the -- in the closet.

5 Q. Including the pictures of the --
6 the contents that were taken from the
7 closet?

8 A. Correct. Not -- none -- none of
9 that evidence to my knowledge has -- has
10 been subjected to any -- any kind of photo
11 documentation, measurements,
12 characterization that would confirm that
13 that was evidence of -- of a battery from --
14 evidence of material expelled from the --
15 from the instant battery pack.

16 Q. And so did you check with
17 Mr. Gorbett, because Mr. Karasinski says in
18 his report and at his deposition that all of
19 the investigators that were there on
20 February 27, 2020 were part of the
21 examination of the materials taken out of
22 the closet when this piece of battery was
23 found?

24 Did you talk to Mr. Gorbett to
25 confirm your suspicion that that's not true?

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1 MS. WANEMAKER: Object to the
2 form.

3 You can answer.

4 A. Yeah. I -- I've never spoken to
5 -- to Mr. Gorbett and -- and that particular
6 piece, the -- the only -- the only photo of
7 anything that has been claimed to be part of
8 the instant battery was -- was a part of
9 Karasinski's rebuttal report. So that was
10 not ever shown or analyzed in the evidence
11 that was examined in October of 2020.

12 So at the time I wrote the
13 report and until I saw Karasinski's rebuttal
14 report, I was not aware of anybody claiming
15 that there was any battery material that was
16 found in the closet.

17 Q. All right. So it's your
18 understanding that Mr. Gorbett is still
19 alive?

20 A. I've never spoken to
21 Mr. Gorbett. I -- I hope he's doing well.

22 Q. Okay. Well, if he is doing well
23 and it's our understanding that he's -- he's
24 doing well and fine, your use of the word
25 "claim" with regard to what Mr. Karasinski

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1 said would be easily checked by checking
2 with Mr. Gorbett to see if he witnessed that
3 piece of evidence being taken out of the
4 closet, right?

5 Then you can take the word
6 "claim" out of it and you would know that
7 that was found in the closet?

8 MS. WANEMAKER: Object to the
9 form.

10 A. I -- I -- I --- I mean, I would
11 have to assume that if a piece of evidence
12 was found in the closet, that that would
13 have been a critical -- and -- and the
14 closet is what the fire investigators have
15 assigned as the area of origin, that that
16 piece of evidence would have been included
17 in the October 27th -- if you know,
18 inspection.

19 My understanding is that that
20 was not, and at the time I wrote the report
21 and until I saw Karasinski's rebuttal
22 report, I -- I had not seen - I -- that --
23 that was all brand new information to me. I
24 would have assumed that if that was a
25 critical piece of evidence that was found at

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1 the inspection and Mr. Karasinski thought
2 that that was critical and could have been
3 an initiation in the closet, that that would
4 have been subjected to extensive analysis at
5 the October 2020 examination, and --

6 Q. So --

7 A. -- for whatever reason, it
8 wasn't. All I have seen is a blurry
9 photo --

10 Q. Keep going. Just keep going.
11 Just tell me when you're going to be done
12 and then we can go back to questions.

13 A. All I've seen is a blurry photo
14 of something that Karasinski says is a piece
15 of battery that has not been subjected to my
16 knowledge to any other laboratory
17 examination. That's all -- as I sit here
18 today, that's all I can tell you.

19 Q. All right. And that was my
20 question, is: If you have such questions,
21 you've learned this since Mr. Karasinski's
22 report.

23 Have you asked the HP attorneys
24 to talk to Mr. Gorbett to verify that that
25 piece was found in the closet?

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1 A. I have not.

2 Q. So you would -- you're relying
3 on your assumption of what would be and what
4 wasn't done, but you didn't go to the source
5 of information that would tell you
6 definitively whether that piece was found in
7 the closet?

8 MS. WANEMAKER: Object to the
9 form.

10 A. All I can -- all I can refer to
11 is what Karasinski says in his opening
12 report, where that was not a piece of
13 evidence that was ever mentioned. It was
14 only mentioned at -- his rebuttal report and
15 that was not analyzed to my understanding at
16 the October inspection.

17 Q. Okay. When you say all you can
18 refer to, did HP's attorney say that you
19 couldn't talk to Mr. Gorbett to verify that
20 fact, as you're saying you've been
21 prohibited from referring to anything, but
22 your assumptions about what should have or
23 would have been done?

24 MS. WANEMAKER: I don't want to
25 get into any privileged territory as

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1 to what discussions -- what -- please
2 note my objection to this question.

3 MR. SCHWARZ: I mean, if you
4 want to say that -- that he was
5 instructed to do something by the
6 attorneys, that he couldn't talk to
7 Mr. Gorbett, then I won't ask him any
8 more questions if that's the -- the
9 instruction, Jackie.

10 MS. WANEMAKER: No. That's --
11 that's not what I'm saying. I just --
12 I don't want to get into any
13 potentially privileged territory, and
14 also object to the form of your
15 question.

16 MR. SCHWARZ: Okay.

17 Q. So I think that means you can
18 answer it.

19 Were you prohibited from talking
20 to Mr. Gorbett to verify what was in
21 Mr. Karasinski's rebuttal report that you're
22 saying you don't believe?

23 A. I was not -- I did not ask, nor
24 was I -- was I told that I was prohibited.

25 Q. So you chose instead to assume

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1 that that piece wasn't found in the closet?

2 MS. WANEMAKER: Objection to the
3 form.

4 You can answer.

5 A. No, no, no, Counselor. That --
6 that -- that is not what I have chosen.
7 What -- all I can do is look at what has
8 been provided by Plaintiff's experts, and
9 Plaintiff's expert in the opening report --
10 in his opening report never pointed to any
11 piece of battery that he claimed was found
12 in the closet.

13 All of the battery pieces that
14 were analyzed, that were -- that were
15 collected from the February scene inspection
16 and analyzed in the October 2020 inspection
17 were collected from the office area, not
18 from the closet. That's my understanding.

19 They were tagged, there was a
20 map of the room, they were -- there were --
21 there was indications and photo
22 documentation, as well as schematics of
23 where those components were found at that
24 October inspection. There were -- there was
25 nothing that was claimed to be found in the

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1 closet.

2 The only thing I have seen is a
3 blurry photo in Karasinski's rebuttal report
4 that shows what he claims is a component
5 from the instant battery with no proof, no
6 analysis, no anything on -- on, you know,
7 showing what exactly that is. That's all I
8 can say.

9 Q. Okay. So that's what I'm trying
10 to get at. So that's all you can say from
11 the initial report. Then you got a
12 subsequent report that provided information
13 that a piece of the battery was found inside
14 the battery pack. In your initial -- I'm
15 sorry, withdraw that question.

16 In your initial report, you
17 assumed that no battery interior components
18 were found in the closet, correct?

19 A. I don't want to say I assumed
20 it. What I -- all I can tell you is that
21 there were no battery components at the time
22 I wrote my report --

23 Q. All right. All right. Let me
24 -- I'm going to withdraw the question. I'm
25 going to withdraw the question.

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1 In coming to your opinion, did
2 you base your opinion on the fact based upon
3 how you understood the facts that no battery
4 components were found in the closet?

5 A. Correct.

6 Q. Okay. Now you have learned that
7 Mr. Karasinski, who was there at the scene
8 along with the other eight people that you
9 listed here on this page, says, indeed a
10 piece of the battery interior component was
11 found in the closet, and you said that in
12 light of that or in spite of that, your
13 opinion remains that no battery materials
14 were found in the closet, correct?

15 A. My --

16 MS. WANEMAKER: Object to the
17 form.

18 You can answer if you're able.

19 Q. In other words, did you -- did
20 you change your assessment of the facts
21 based upon the evidence that Mr. Karasinski
22 presented, and I think the answer is no,
23 right?

24 A. You've doubled-up on the
25 questions. Can I go back to the first one?

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1 Q. Not if it's going to be a
2 20-minute answer, but in other words, I'm
3 trying to get at, you had a certain set of
4 facts that you used to come to your
5 conclusion in your -- in your report,
6 correct?

7 A. Correct.

8 Q. And one of those facts was that
9 there were no battery components found in
10 the closet?

11 A. Correct.

12 Q. Okay. Subsequent to you writing
13 your report, Mr. Karasinski has presented
14 evidence that, at least his testimony, and
15 his photograph, and his report, that battery
16 components were found in the closet,
17 correct?

18 A. That's what he claims. They
19 are --

20 Q. Yes.

21 A. -- unsubstantiated.

22 Q. Okay. And so because you
23 believe they're unsubstantiated, did you
24 therefore -- do you continue now to -- to
25 believe that no components were found in the

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1 closet?

2 A. All I can say is that there have
3 not been any -- any components from the
4 instant battery that have been confirmed to
5 have been found in the closet.

6 Q. Okay. And as a result of that,
7 your opinion is based on the -- the
8 assumption or fact, in your view, that there
9 were no components found in the closet?

10 A. There have been no components
11 that have been -- there have been no --
12 there has been no evidence extracted from
13 the closet to my knowledge that have been
14 confirmed to have been from the instant
15 battery pack.

16 Q. Okay. Now, the -- Mr. Gorbett,
17 on behalf of HP, was present at the time
18 that Mr. Karasinski claims that he found --
19 he and the other investigators that were
20 there, found the piece of the battery inside
21 the closet; you're aware of that?

22 MS. WANEMAKER: Object to the
23 form.

24 A. I -- the way that you're -- the
25 question is phrased is that you're asking me

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1 if Mr. Gorbett was present when
2 Mr. Karasinski claims he found evidence of
3 the battery in the closet, and I -- I -- I
4 -- my understanding is that Mr. Karasinski
5 didn't claim to have found evidence of the
6 battery in the closet until after I
7 submitted my opening report and he wrote his
8 rebuttal report.

9 Q. I guess that's what I'm getting
10 at. In other words, instead of you having
11 to assume whether there was a piece of
12 battery in the closet or not, Mr. Gorbett,
13 who is an HP representative, was present and
14 you could ask him, and that way, there would
15 be no question in your mind whether
16 Mr. Karasinski is telling the truth or not
17 and whether you can accept Mr. Karasinski's
18 representation or not, and you haven't done
19 that, right?

20 MS. WANEMAKER: Object to the
21 form.

22 You can answer.

23 A. Counselor, I -- I have to -- I'm
24 -- you -- you're implying that -- you -- you
25 -- and we can have the court reporter go

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1 back and -- and -- and state this, but
2 you're -- you just said that I'm implying
3 that Mr. Karasinski is not being truthful,
4 and that is -- that's a complete
5 mischaracterization of -- of my testimony.
6 I am not saying that.

7 All I am saying -- that, you
8 know, I would -- I would suspect that
9 Mr. Karasinski, if -- if indeed that was
10 evidence that was found from the closet,
11 that that would have been analyzed in
12 October 2020 and not brought to our
13 attention, you know, four to five years
14 later after my report was issued. If that
15 is indeed the quote, unquote, smoking gun.

16 If that was what caused --
17 initiated the fire in the closet -- and that
18 was found back in February 2020. I don't
19 understand why five years later, the first
20 time we've heard of it is in his rebuttal
21 report. All I'm saying is that from my
22 perspective, I have to look at the facts of
23 the case and the evidence, and the confirmed
24 evidence that has been analyzed at the
25 October 2020 inspection was on materials

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1 that were found from the office.

2 No evidence, and to my
3 knowledge, was analyzed at that inspection
4 that was purportedly from the instant
5 battery, came from the closet. The first
6 that we've learned of that is five years
7 later.

8 That's all I can say. So
9 there's a blurry picture of something that
10 Mr. Karasinski says five years later is from
11 the battery pack, right? That has not been
12 analyzed. There has been no subsequent
13 photos, there has been no analysis of that
14 -- that -- similar to what was done on the
15 debris that was found from the office area,
16 and that's what I have to base my opinion
17 on.

18 Q. Okay. I -- you haven't answered
19 my question and we'll move on. My question
20 was: If you -- if you have issues with
21 whether a piece was found in the closet.
22 There were nine other witnesses there when
23 that piece was extracted and you've chosen
24 not to contact the person from HP who
25 witnessed it being retrieved from the

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1 closet.

2 You've chosen instead to decide
3 that, because you only learned of this now,
4 it can't be true, right?

5 A. That is incorrect, and that
6 misrepresents my --

7 Q. Okay. Then we'll move on. If
8 that's a misrepresentation, we'll move on.
9 I think the -- the testimony will speak for
10 itself.

11 And you didn't look in
12 Mr. Gorbett's notes to see if he noted
13 anything in his notes about a piece of the
14 battery being found in the closet?

15 A. I -- I certainly don't recall
16 seeing anything in Mr. Gorbett's notes that
17 indicated there was a piece of battery found
18 in the closet.

19 Q. And do you have Mr. Gorbett's
20 notes available that you could look at now
21 to see if there's anything in there?

22 A. I -- I do not. I'm -- I'm
23 taking this deposition from my home office.
24 I don't have my -- my complete file here.

25 Q. Well --

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1 A. Unless -- unless perhaps they're
2 in the binder -- in this binder and you can
3 point me to them.

4 Q. Well, you -- well, I haven't
5 seen Mr. Gorbett's notes. That's why I ask
6 you about it, because they haven't been
7 produced to us, but they seem to be highly
8 relevant here to see if the things that
9 you're questioning as evidence was actually
10 contained in Mr. Gorbett's notes.

11 So I think without question, we
12 should get them now; don't you think?

13 A. I think you should probably ask
14 Mr. Karasinski why he didn't select that
15 piece of material that was found in what he
16 claims is the area of origin and he claims
17 is part of the battery, why he didn't select
18 that as part of the evidence exam in 2020.

19 From my perspective, it would
20 imply to me, at least, that at the time, he
21 didn't feel that that was an important piece
22 of evidence. So I would -- rather than ask
23 Mr. Gorbett, I would prefer to ask
24 Mr. Karasinski.

25 Q. Okay. Let me ask you this

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1 question: What -- what leads you to the
2 conclusion that the battery windings that
3 were taken as evidence didn't include that
4 piece?

5 A. Because I haven't seen -- my --
6 my -- the photos that I have seen and from
7 the October 27, 2020 inspection did not
8 include that piece.

9 Q. Okay. And how do you know that?

10 A. Because the evidence that was --
11 that was at the inspection was -- there are
12 photos of the office scene. All of the
13 evidence was tagged, labeled with respect to
14 the location it was found in the office, and
15 that's what was removed and examined at the
16 inspection.

17 There was no evidence that I saw
18 from any of the inspection photos that was
19 removed from the closet that was -- that was
20 claimed to be part of the battery.

21 Q. So you weren't present at the
22 inspection at the house and you weren't
23 present at the inspection at the laboratory,
24 but you've been able to tell from
25 photographs that what was inspected in a

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1 laboratory was not the piece of winding that
2 was in the closet?

3 A. Correct.

4 Q. Okay. And you wouldn't be
5 interested in asking Mr. Gorbett what his
6 recollection was and whether anything was
7 found in the closet or why Mr. Gorbett
8 didn't choose other evidence to bring to the
9 laboratory? That is not something that you
10 would be interested in?

11 A. No. I would be more interested
12 in asking Mr. Karasinski about -- why, you
13 know, five years after the inspection, he
14 would show a blurry photograph and claim
15 that that was a piece of evidence that is
16 critical to the case, but yet he did not
17 select that for inspection at the evidence.

18 That would be the question --
19 that's the person I would want to ask, and
20 talk to, and understand what that -- what
21 his -- his thinking was there.

22 Q. So do you believe then that --
23 that Mr. Karasinski was the only fire
24 inspector that was on the scene on
25 February 20th that was interested in the

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1 cause and origin of the fire?

2 A. I --

3 Q. Well, you keep saying that you
4 would ask --

5 A. No, sir --

6 Q. -- Karasinski why he didn't do
7 something when there were nine other people
8 that were also there that could have done
9 exactly the same thing that you don't want
10 to ask, including the HP representative.

11 A. Because Mr. Karasinski is the
12 only person who is claiming that there is a
13 piece of the battery that was found in the
14 closet.

15 Q. Did you see Mr. Gorbett's report
16 of his -- his findings of the cause and
17 origin of the fire?

18 A. I believe that I -- yes, I have.

19 Q. And what was the cause and
20 origin of the fire according to Mr. Gorbett?

21 A. I believe he pointed to the
22 closet -- to the closet as the -- as the
23 origin of the fire.

24 Q. And do you believe he also
25 pointed to the HP laptop as the cause of the

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1 -- the ignition source for the closet for
2 the fire?

3 A. I -- I don't recall.

4 Q. And Mr. Gorbett was HP's
5 representative on the scene, who actually
6 did the investigation to determine the cause
7 and origin, correct?

8 A. My understanding is that
9 Mr. Gorbett was HP's representative on the
10 scene, yes.

11 Q. Okay. All right. On Page 15 of
12 your report, make sure I'm on the right
13 page. Yeah. You've got -- Figure 4, you've
14 got the photographs of the laptop and the
15 armoire shelf where the laptop was found,
16 correct?

17 A. Correct.

18 Q. And then you describe in the
19 last sentence on that page, you say, both
20 cell cans have de-crimped and ejected their
21 internal windings, and some of these
22 windings were found nearby the cells, and I
23 believe you're talking about the two cells
24 that were not in the computer and the two
25 cells that were -- were intact, but the two

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1 cells that were empty; is that what you're
2 referring to?

3 A. What I'm referring to there is
4 the cell cans and the internal windings from
5 those cell cans, found nearby the cell cans.
6 Maybe I should have said cell cans, but yes.

7 Q. Okay. But -- but in any event,
8 just to -- later on, we'll go through it in
9 your report, but there basically were --
10 were three groups of cells of the six,
11 right?

12 There were two that -- that
13 didn't go into thermal runaway that were
14 fused together and were found on the floor,
15 there were two that ruptured and exploded
16 that were found in the laptop, and then
17 there were two empty cans that had ejected
18 their contents, and that's what you're
19 referring to at that last pair, the two
20 empty cans here?

21 A. Correct.

22 Q. Okay. That's what I want to get
23 at, and you said -- the next sentence, you
24 said, there was no thermal damage or
25 ignition of the carpet?

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1 A. Where the cells were observed,
2 correct.

3 Q. So -- and you base that on your
4 observations of photographs, did you?

5 A. Yes.

6 Q. Okay. Take a look at Tab 12,
7 which we'll mark as Exhibit 6, which is
8 Mr. Litzinger's report.

9 (Exhibit 6, Mr. Litzinger's
10 Report, was received and marked for
11 identification by the reporter.)

12 A. Okay.

13 Q. And specifically on Page 15,
14 Figure 21.

15 A. Okay.

16 Q. Now, Mr. Litzinger testified and
17 represented that -- let me find that --
18 yeah. On Page 15, you'll see there's a can
19 on a piece of carpet.

20 A. Correct.

21 Q. And you see that there's black
22 char near the top of that can and sort of a
23 diagonal line that goes off the photograph?

24 A. I -- I see that there is some
25 black residue on the carpet. Whether that's

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1 -- I don't -- I mean, char or not. I mean,
2 there's char all over the room. So -- so
3 yeah. I mean, I see that there's -- there's
4 some black on the carpet.

5 Q. And -- and how did you determine
6 that that wasn't char as Mr. Litzinger
7 indicated it was, which would be evidence of
8 thermal damage to the carpet in the area of
9 where this can was? How did you make that
10 determination?

11 A. I make that determination,
12 because the can itself has -- has basically
13 no heat. So the can has expelled its
14 contents. The contents of the -- of the
15 cell is the fuel, that's what's generating
16 the heat.

17 What you have is an empty can
18 that is almost instantaneously cooled as it
19 flies through the room, and so the can is
20 not hot. When you have a thermal event that
21 causes a cell to expel its contents, the can
22 itself is not just generating heat. It's
23 the contents of the cell that are reacting.

24 So the can is not hot, and
25 that's evidence by the fact that, you know,

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1 that at least one of the cans still has, you
2 know, that has ruptured, still has part of
3 its label on. So the can itself does not
4 get hot or it doesn't get very hot when it
5 expels its contents. So the can itself is
6 not really an ignition source.

7 Q. So the -- this can wound up
8 across the room, correct?

9 A. Well, it's -- it separate --
10 yes. It expelled itself -- ejected itself
11 from the computer, correct.

12 Q. Right. And it traveled
13 somewhere in the vicinity of ten to 15 feet?

14 A. I -- I'm sorry, I -- I don't
15 know exactly how far it fell. I mean, I
16 think in my report, there is a -- there's a
17 schematic of the room, you know, and where
18 -- where that particular can was found and
19 probably make a measurement on exactly how
20 far it was, you know, from the computer.
21 Several feet, I believe.

22 Q. What -- what -- what was the
23 energy source that propelled it to travel on
24 its own out of the battery component -- out
25 of the battery compartment across the room?

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1 A. Gas generation within the --
2 within the cell.

3 Q. And you're saying that in your
4 experience -- and when -- a gas generation
5 would be sort of an explosive event, right?

6 A. It's -- it's an
7 overpressurization event of the can, yes.

8 Q. And that would -- when it
9 releases its contents, it would be a
10 reactionary force that would propel the can
11 in the opposite direction?

12 A. Yes. Generally, that -- that is
13 what happens, yes.

14 Q. And so the force of -- and you
15 told me, I think, that thermal runaway can
16 -- reactions can run somewhere in the 600
17 Celsius range, which is over 1,000 degrees
18 Fahrenheit, right?

19 A. Correct.

20 Q. So it's your testimony that an
21 explosion of the cell contents propelled the
22 can that was somewhere over 1,000 degrees
23 Fahrenheit, and when it went five or ten
24 feet, by the time it landed, it had cooled,
25 so that there would be no heat that would

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1 char the carpet?

2 A. To be more specific, cell cans,
3 when they -- when -- when the cell does not
4 expel its contents during a thermal runaway
5 event, the can itself can get red hot,
6 right, because the fuel -- the -- the -- the
7 chemical energy that is resulting in the
8 heat is heating up the can, but when the
9 cell can actually expels the contents, the
10 can itself doesn't actually get very hot.

11 Q. Okay. So let me get this
12 straight. So you're saying that -- this --
13 this is made out of what kind of metal?

14 A. The can?

15 Q. Yeah.

16 A. Battery grade steel,
17 nickel-plated.

18 Q. So the steel can contains
19 contents that were over 1,000 degrees
20 Fahrenheit?

21 A. Briefly, yeah. I mean, well --
22 brief -- could be briefly.

23 Q. Okay. But when they got to
24 1,000 degrees Fahrenheit, they didn't get
25 there from ten degrees, they went gradually

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1 to 1,000 degrees or -- or actually, they
2 went through the other degrees before they
3 got to 1,000, right?

4 A. So try -- try to -- try to
5 explain this. What -- when -- when a cell
6 expels its contents because of rapid
7 pressure buildup, the contents are not
8 necessarily 1,000 degrees Fahrenheit at that
9 point, right? It's -- the reaction is
10 generating gas very rapidly, and it can
11 expel its contents before the can -- before
12 those contents actually complete their
13 reaction.

14 So when we're talking about
15 temperatures within the cell approaching,
16 you know, above 660 degrees Celsius, you
17 know, up to 1,000 degrees or slightly less,
18 you know, 800ish degrees Celsius within --
19 that's when the contents stay within the
20 can.

21 When they are ejected from the
22 can, especially when they're ejected, and
23 basically, the contents sort of turn into
24 confetti, then you don't see temperature as
25 -- as high, because basically, all the

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1 chemicals that are trying to react together,
2 they kind of come apart and they spread
3 throughout the -- the area, and the can
4 itself does not get that hot.

5 When it expels the contents, the
6 can doesn't get as hot as what it would if
7 the contents stayed inside the can.

8 Q. So you think while that was
9 going on, while that explosion was going on,
10 you can touch the outside of the can, you
11 would have no damage to the skin, because it
12 would be cool to the touch?

13 A. You're talking about -- thermal
14 -- thermal necrosity [sic] of the -- of your
15 -- of your skin and that occurs at
16 temperatures that are much, much lower than
17 what we're talking about here.

18 I think the important point on
19 that photo is that there's no indication
20 that there was melted carpet contacting the
21 surface. There's no -- carpet is -- the
22 carpet is a polymer, it's a plastic. If the
23 can was hot when it landed on the carpet,
24 the carpet would have been melted and stuck
25 to the cell -- to the can, and there's no

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1 photographic documentation that that's the
2 case. The -- the can itself was not melted
3 into the carpet, right? So you --

4 Q. What --

5 A. -- right, so -- if -- if -- if
6 -- if the cell can was hot enough to char
7 the carpet, it would certainly be hot enough
8 to melt the carpet, right?

9 Q. Isn't -- isn't the char on the
10 carpet equivalent to a melting of the carpet
11 in the area where the char is?

12 A. No. The carpet will melt long
13 before it actually begins to decompose and
14 char.

15 Q. And what -- what was the -- the
16 material that the carpet was made out of and
17 what type of fire retardant was used on the
18 that?

19 A. I -- I --

20 MS. WANEMAKER: Object to the
21 form.

22 A. All I can tell you is that if
23 it's -- it's most likely a polymer carpet,
24 and that's what most carpets are made out
25 of. Unless it was wool, but, you know, my

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1 expectation would be that, normally, what
2 you see is, you see melting and adhesion of
3 the polymer fibers to a can in a hot -- in a
4 hot battery when it hits the carpet, and if
5 it is sufficiently hot, then you may get
6 charring, but the melting happens first.

7 That's, you know, if you look at
8 any polymer, you're going to get melting,
9 and then at a higher temperature, you're
10 going to get charring. So --

11 Q. Were you able to view the carpet
12 underneath the -- the can to see if there
13 was any melting?

14 A. Well, I -- I -- what I -- what I
15 don't see from any of the photos of the can
16 removed, is adhesion of carpet or fibers to
17 the -- to the can. So it's -- this is --
18 this is not -- this is very consistent with
19 -- with battery science.

20 When you eject the contents from
21 the can, it happens very, very quickly. The
22 can does not actually get that hot, because
23 the fuel is leaving the cell can. Now, if
24 the fuel stays within the cell can, then the
25 can can get extremely hot. It can get red

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1 hot, it can get well-above 660 degrees
2 Celsius.

3 That's different, but when it
4 expels its contents, it's expelled the fuel,
5 as well as the vast majority of its thermal
6 mass. You have less than ten percent of the
7 thermal mass in the can itself. So it's
8 going to cool very rapidly, and it's not a
9 surprise that the can -- the can would not
10 be an ignition source.

11 Q. No one -- no one said it was, no
12 one said it was, and just so I'm -- I'm
13 clear, I -- I think I understand, but you're
14 not saying that before the can expels its
15 contents, the can would be some fraction of
16 the temperature of the internal components,
17 like, some small fraction, like, it'd be
18 kind of cool, but the inside would be three,
19 four, 500 degrees Celsius?

20 A. Generally, when you are heating
21 a -- a 18650 cell up from an external heat
22 source, obviously, you know, the can itself
23 is going to get to, you know, around, you
24 know, before -- at the point where you have
25 a thermal event. The can itself is going to

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1 be -- is being heated from an external
2 source.

3 At the point where you get a
4 thermal event, that's when the internal
5 chemistry starts to take over and you start
6 getting inside-out heating. In the
7 situations where you expel the contents,
8 that inside-out heating doesn't have a
9 chance to really get the can itself higher
10 than what the external heating has -- has
11 caused the can to get.

12 So the can, at the point when it
13 expelled its contents, is probably going to
14 be right around 185 to 200 degrees
15 Celsius-ish, right in that -- right in that
16 vicinity, but it expels the contents. So
17 it's not going to get really any hotter than
18 that, because, again, there's no other heat
19 source, right?

20 It's -- it's been blown away
21 from the computer, it's now on the -- on the
22 carpet. That's a cool location, and the
23 can's going to cool very rapidly, because it
24 has very little thermal mass.

25 Q. And is that based upon your

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1 experiments in causing thermal runaway from
2 external heating sources?

3 A. In part, absolutely.

4 Q. Okay. What is your basis of
5 saying that that's the same temperature
6 would be if the thermal runaway that
7 happened from internal heating alone and
8 without an external source, would it be
9 different in that circumstance or the same?

10 A. It would be different in that
11 circumstance, because when you have an
12 internal source, like an internal cell
13 defect, then the cell does not expel its
14 internal contents, and in that situation,
15 the can does get -- can get very, very hot,
16 you know, almost as hot as the inside of the
17 cell.

18 So again, there are -- I've
19 certainly seen situations where, because of
20 an internal cell fault, the can itself can
21 reach temperatures that you can actually
22 see, you know, it becomes -- starts to
23 become red hot. You can actually see that.
24 So in those --

25 Q. In those -- in those

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1 circumstances, I understand that the cell
2 can never expel its contents; in your
3 experience?

4 A. The cells -- cells are -- 18650
5 cells are designed and -- and tested and
6 designed to not expel contents when they
7 fail due to internal cell defects.

8 Q. So that would be -- yeah. Based
9 upon your analysis, that has never happened
10 and it's impossible and that proves your
11 theory that it must have been an external
12 source, because if it was an internal
13 source, there could be no battery components
14 anywhere -- or internal components anywhere,
15 they would all still be in the cells?

16 MS. WANEMAKER: Object to the
17 form.

18 You can answer if you're able.

19 A. Based -- based on, you know,
20 25 years of testing of -- of -- of 18 --
21 18650 and other lithium ion cells.
22 Everything that we see here is consistent
23 with that, and not only that, I mean, we
24 don't -- we don't look at any one piece of
25 evidence in a vacuum, right?

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1 We're looking at the fact that
2 it wasn't just one, but two cells that
3 de-crimped and two cells that -- that
4 ruptured. So we've got four cells that have
5 had rupturing events out of six. What that
6 indicates is that this is not an internal
7 cell defect.

8 That is an external heat applied
9 to the battery pack that is causing the
10 cells to very rapidly go into thermal
11 runaway, generate gas that overwhelms the
12 vent, causes the can to failure -- fail, and
13 not just one cell, but in four of the six
14 cells in the battery pack.

15 Q. In your theory, all six cells
16 were exposed to exactly the same thermal
17 heat source, right?

18 A. Well, all six cells would been
19 in the computer at the time that the fire,
20 you know, encroached on the -- the heat from
21 the fire encroached on the computer.

22 Q. Right. So all six cells -- all
23 six cells were exposed to the same external
24 heat source under your theory, but only four
25 of them went into thermal runaway and the

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1 other two were completely intact?

2 A. Yeah, and -- and that's
3 consistent, right, because one -- I mean,
4 one cell has to go off first, right? I
5 mean, one has to go first. Even if, you
6 know, the best laboratory conditions and you
7 put the cells in an oven or the -- a
8 constant radiating heat source, they're not
9 all going to go off instantaneously, right?

10 One's going to be a little bit
11 hotter, one's going to go off first. Now,
12 in the event that you have expulsion, what
13 happened -- what happened in this case is
14 that the first cells that went, blew out the
15 -- the two cells that were found that didn't
16 have a thermal event, blew them to a part of
17 the room that was cooler.

18 So those cells had not gone into
19 the Stage 3. They were still in Stage 2,
20 and so they went to a cooler location. They
21 were able to cool down, they didn't go into
22 thermal runaway. That's very consistent
23 with what we saw when we have cells being
24 expelled from the pack before they actually
25 reach that critical temperature.

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1 Q. And just so I know, can you give
2 me any references that support your
3 contention that internal causes of thermal
4 runaway never result in expulsion of the
5 internal cell material?

6 A. Again, I'll -- I'll point you to
7 the standards that I referenced, right,
8 which is -- which is --

9 Q. In the standard, it says that?

10 A. In the standards, the -- the
11 important point of the standards is that all
12 of the tests that are conducted in the
13 standards require that the cells do not
14 expel their internal contents, except when
15 exposed to an external heat source, such as
16 flame impingement.

17 In which case, the cells can
18 expel their internal contents and still pass
19 the standards, right? What that tells you
20 is that -- and the standards subject cells
21 to overcharge, overdischarge, over-current,
22 all kinds of testing, right? They can't --
23 and under those conditions, expel their
24 contents, unless they're exposed to a fire,
25 and now when they're exposed to a fire, they

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1 can pass the standards and -- and still
2 expel their contents.

3 So that right there tells you
4 that the industry-accepted behavior of 18650
5 lithium ion cells is that if they have an
6 internal fault, they don't expel their
7 contents. If they're exposed to a fire,
8 they can expel their internal contents.

9 Q. And I misunderstood the
10 testimony of a prior witness, because I
11 thought that the standard required the --
12 the cells to be exposed to something like
13 130 degrees Celsius.

14 Are you saying that the
15 standards require them to be exposed to the
16 200-degrees Celsius temperature that would
17 -- would go into Phase -- Phase 3 of thermal
18 runaway, is that the standard you're talking
19 about?

20 A. You -- if you look at the UL
21 standards, there is an oven test that
22 exposes the cell for a brief period of time
23 at 130 degrees Celsius, and in addition to
24 that, there's a test called the projectile
25 test, which exposes the cell to an external

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1 flame.

2 Q. So --

3 A. So I don't know who -- which --
4 which expert you were talking to, but --

5 Q. Okay.

6 A. -- you'd have to look. The
7 standards have many, many different tests.

8 Q. Yes.

9 A. The external flame is part of
10 those tests, yes.

11 Q. Okay.

12 A. And -- and that -- that test
13 does -- and if you read the standard, it
14 does stipulate that an explosion may occur
15 and that, you know, proper safety
16 conditions, including hearing protection and
17 things need to be employed, because when
18 these cells expel their contents, it's loud.

19 It's like a gunshot going off.
20 When they expel their contents from a
21 computer and -- and shoot through a
22 computer, that is a very loud event. So --
23 and it's very energetic, so you have to have
24 the appropriate safety precautions in place
25 to make sure that, you know, nobody gets

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1 hurt while you're doing those types of
2 tests.

3 Q. Now, I'm going to ask my
4 question now and see if you can answer. I'm
5 not talking about the flame, I'm talking
6 about without a flame, the highest
7 temperature the standard requires the
8 batteries to be exposed to is 130 degrees;
9 is that correct?

10 A. Yeah. That's the oven test,
11 correct.

12 Q. Yes. And -- and you just said
13 too, that that 130-degree temperature is
14 only for a brief period of time?

15 A. Correct, yes. It used to --

16 Q. You're saying that --

17 A. It used --

18 Q. Let me -- go ahead, go ahead.

19 A. No. It used to be 150, but it's
20 been brought down to 130, you know, maybe
21 around 2005ish timeframe.

22 Q. Okay. So as I understand it
23 then, you're saying that the fact that a
24 cell doesn't go into thermal runaway when
25 exposed to an external heat of 130 degrees

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1 Celsius for a brief period of time, is your
2 proof that internal defects in a battery
3 that cause thermal runaway, never causes
4 explosion of the internal components of the
5 battery, only -- only the flame would do
6 that, you're saying?

7 A. Yeah. Only when you heat the
8 cell externally up to the thermal runaway
9 point -- only when you heat the cell up to
10 the thermal runaway point from an external
11 heating source.

12 So you -- so you have to heat it
13 up to, you know, 185, 180 plus from an
14 external heat source in order to possibly,
15 not -- and again, it's a bit stochastic. So
16 not every cell is going to expel its
17 contents when you heat it up that high, but
18 there's a possibility that when you heat it
19 up to the thermal runaway condition via an
20 external heat source, that it can expel its
21 contents.

22 Q. Right. But -- but the point was
23 that, I asked you for references as to your
24 absolute statement that an internal cause of
25 thermal runaway never causes explosion of

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1 the battery contents, and you pointed me to
2 the UL standard that requires from an
3 external force -- external heat for a brief
4 period of time at 130 degrees, and is that
5 part of the test that you're saying shows
6 you that it -- it can't expel its contents
7 from internal heat alone, it has to be
8 external heat, is that -- is that your proof
9 of that?

10 I'm just trying to get it clear.

11 MS. WANEMAKER: Object to the
12 form.

13 You can answer.

14 A. It's the totality of the testing
15 that is incorporated --

16 Q. Okay. So we know one test now
17 -- okay. So the one test that you've
18 mentioned is the proof of your theorem that
19 internal cell defects causing thermal
20 runaway can cause ejection of the contents.
21 One part is the 130 degrees brief period of
22 time, external source test.

23 Now, you said there's a
24 totality, so tell me what else you're
25 relying on from the UL standard that gives

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1 you confidence that you can make this
2 statement that the type of ejection that
3 happened here could never happen from an
4 internal thermal runaway event.

5 What else is there other than
6 what you've told me already about the flame
7 test and of the oven test, what else?

8 MS. WANEMAKER: Objection to the
9 form.

10 You can answer.

11 A. I don't have U -- the -- the UL
12 testing memorized as far as every single
13 test, but there are multiple tests that are
14 part of the UL safety standards for -- for
15 -- for lithium ion cells.

16 They -- which subject the cells
17 to various different conditions, overcharge,
18 overdischarge, the oven test, and additional
19 types of testing, and the requirement in all
20 of those tests is that the cells do not
21 expel their contents, right? That's --
22 that's the -- that's the foundation, right?

23 We don't want the can to expel
24 its contents, we don't want the can to have
25 a crimp release or rupture, right, except

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1 when it explode -- expose it to a fire.

2 That --

3 Q. Let me -- let me -- can I -- can
4 I just break this down, because I know you
5 like to go on for a long time, but I want to
6 try to be as concise as possible.

7 So you're saying that in
8 addition to the test that you told me about
9 with the flame and with the oven, there are
10 other tests where they expose the -- the --
11 the battery cells to overcharge, and are you
12 saying that they expose them to overcharge
13 to the point that they go into thermal
14 runaway?

15 A. No. They expose the cell to
16 overcharge under, you know, for -- under the
17 conditions of the test, and if the cell
18 expels its contents, it fails. Again --

19 Q. I'm sorry --

20 A. The point is that --

21 Q. No. That's -- that's not the
22 point. What I'm asking you is, is the -- is
23 the design of the test to -- to expose the
24 cell to overcharge to the extent it causes
25 thermal runaway?

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1 A. The design of the test is to
2 expose the cell to various different misuse
3 and abuse conditions to show that the cell
4 will not, you know, explode.

5 Q. And wouldn't it depend then on
6 the extent of the overcharge and
7 overvoltage? In other words, do they -- do
8 they -- are they setting it at a overcharge
9 level that they know will cause thermal
10 runaway in most cells or are they setting it
11 to an overcharge situation that is above the
12 normal operating range, but below where you
13 would expect thermal runaway to occur?

14 What is your understanding of
15 that?

16 A. You're -- you're -- for 18650
17 cells, unless you are charging them at a
18 very high rate, higher than what is
19 specified, the cells are not going to go
20 into thermal runaway.

21 Q. Okay. I'm sorry. We're not
22 talking about what your opinion of 18650
23 cells -- we're talking about the UL standard
24 that you pointed me to, okay? You told me
25 that you're relying on the UL standard as

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1 your proof of your support for your opinion
2 of a certain condition cannot occur from
3 internal thermal runaway.

4 So now we're just talking about
5 the UL, not everything else you want to talk
6 about. The UL standard for overcharge
7 testing, what extent of overcharge is
8 specified that the cell has to withstand; do
9 you know?

10 A. Off the top of my head, I don't
11 have that committed to memory. So no, I --
12 I -- I can't answer that question off the
13 top of my head.

14 Q. Okay. And when was the last
15 time you looked at the UL standard and
16 compared it to any test of cells that were
17 put into internal runaway -- internal
18 thermal runaway by overcharge?

19 A. I -- I -- I can't recall when
20 the last time I -- I -- I reviewed that
21 section of the UL standard.

22 Q. So you have no idea of what the
23 literature shows is a sufficient amount of
24 overcharge to cause thermal runaway --
25 thermal runaway, and you have no idea what

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1 -- whether the temperature or the -- the
2 overcharge that's in the UL standard is
3 equal to that or less than that?

4 A. You're asking me --

5 MS. WANEMAKER: Objection.

6 A. -- specific questions and asking
7 me to recite specific numbers from -- from
8 memory from an extensive standard, and as I
9 sit here right now during this deposition, I
10 don't have those numbers committed to
11 memory. I'm sorry, Counselor. I would have
12 to review the standard.

13 Q. Well, I thought that you did
14 review the standards in order to come to
15 your report, because you listed them in the
16 materials you reviewed; do you remember
17 that?

18 A. Counselor, I did not commit the
19 entire standard to memory.

20 Q. Got it. Okay. Now, we'll move
21 on. So if you could turn to Page 19 of your
22 report, and at the bottom of Page 19, you
23 describe what you -- in other words, you
24 call each cell a different number.

25 Those are numbers that you

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1 decided to apply to them, right, or are
2 those cells -- are those numbers that were
3 somehow, you know, designated in the battery
4 management -- or the battery system?

5 A. As I recall, Counselor, those
6 were numbers that were assigned by somebody,
7 and I don't -- and I was trying to be
8 consistent. I don't recall off the top of
9 my head who initially assigned, like, Cells
10 1 and Cell 2 to Item 1, Cell 3, Cell 4 --
11 called them Cell 3, Cell 4 for Item 7, Cell
12 5, Cell 6.

13 I seem to recall that somebody
14 else had assigned those numbers, but off the
15 top of my head right now, I -- I don't
16 recall. I --

17 Q. Most likely, that were -- those
18 were designations that were made by the --
19 the investigators that went to the scene and
20 found these cells where they found them so
21 they would identify them later?

22 A. That's my understanding, yes.

23 Q. Okay. That's fine. All right.
24 So Cells 1 and 2 then are what you got
25 depicted in Figure 11 on the next page?

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1 A. Correct.

2 Q. And those are the two cells that
3 appear to be -- still be connected in --
4 connected together, so that these were cells
5 that were connected in series?

6 A. They're connected in -- these --
7 Cells 1 and 2 are connected in parallel.

8 Q. In parallel. Okay. And then
9 the -- so there were -- in this battery
10 pack, there were three cells -- three sets
11 of two cells connected in parallel that were
12 then connected in series?

13 A. Yes. It's -- it's -- yes. It's
14 a -- what we would refer to as a 3S2P pack.
15 So you have three blocks of two cells
16 connected to in parallel. So Cells 1 and 2
17 represent one block, cells 3 and 4 represent
18 another parallel block, Cells 5 and 6, a
19 third, and then those three blocks would be
20 connected in series.

21 Q. So these two cells got ejected
22 and were found on the floor of the office,
23 correct?

24 A. Yes.

25 Q. And the picture on the bottom

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1 right of Figure 11 appears to have some
2 material that is fused onto the -- the
3 cells, and is that -- do you assume that to
4 be the -- the shrink-wrap, as you called it,
5 covering that was originally on these cells?

6 A. Yes.

7 Q. Okay. So these cells were
8 protected to some extent by a plastic
9 shrink-wrap that was around them, and then
10 they were inside the battery pack, and then
11 they were inside the computer?

12 A. Yes. They would of had a, you
13 know, the shrink-wrap wrapper on -- on the
14 cell and that would have been -- those cells
15 would have been in this computer, yes.

16 Q. So they were -- they were in the
17 shrink-wrap and then they were in a -- in a
18 hard plastic case, and then they were
19 enclosed inside the computer from the
20 bottom, right?

21 A. From the bottom?

22 Q. You insert the -- you insert the
23 battery pack from the bottom, you don't
24 insert it from the top -- from the -- from
25 the keyboard surface, you insert it from

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1 below the bottom of the computer, right?

2 A. Well, yeah. I mean, I'm not
3 sure exactly where the cells float within
4 the -- in the thickness, but the battery
5 pack itself, does go -- go, you know --

6 Q. It's the wrong term --

7 A. -- bottom of the computer.

8 Q. The battery is installed from
9 beneath?

10 A. Yes.

11 Q. So above the battery compartment
12 area is the surface of the laptop where the
13 keyboard is?

14 A. Correct.

15 Q. Okay. So radiant heat to get
16 through to the battery cells themselves,
17 would have to go through the surface of the
18 computer that is the -- the keyboard surface
19 first? First -- first, it'd have to go
20 through that, right?

21 A. Well, the radiant heat doesn't
22 go through that. The radiant heat heats up
23 the surface and then the -- the conduction
24 is going to --

25 Q. Okay.

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1 A. -- going to go from there. The
2 radiant heat is only going to be line of
3 sight.

4 Q. Okay.

5 A. So -- so --

6 Q. Right. I got it. Let me
7 rephrase it. The radiant heat would hit the
8 top of the -- the surface of the laptop on
9 the keyboard side. It would heat the -- the
10 plastic or metal, whatever that is, and that
11 heat then would be transferred to the hard
12 plastic case of the battery pack, and then
13 that would get hot and that would transfer
14 its heat to the shrink-wrap, and then
15 eventually, that would transfer its heat to
16 the battery cell, and then that would -- the
17 steel, and then that would then transfer its
18 heat to the internal components based upon
19 your theory, correct?

20 A. That's -- that's pretty much --
21 you -- excellent description of how heat
22 transfer works in that situation, yes.

23 Q. Okay. And so the -- the surface
24 of the laptop then, would have to reach a
25 temperature in excess of 200 degrees Celsius

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1 in order to -- there's going to be some loss
2 of heat in that -- in that, correct?

3 A. We would refer to that as a
4 thermal gradient.

5 Q. Right. So in other words, in
6 order to get the inside of the battery cells
7 to 200 degrees Celsius, the surface of the
8 computer by the keyboard would have to get a
9 lot hotter than that in order to -- to --
10 with the heat loss that would occur with
11 each transfer to each material to get the
12 battery components up to 200 degrees
13 Celsius?

14 A. Well, you're neglecting the --
15 the fact that once the batteries get above
16 around 80 to 90 degrees Celsius, that they
17 begin to generate their own heat, right?

18 Q. Okay.

19 A. So your assumption would be true
20 if the batteries were completely discharged
21 and could not generate their own heat,
22 right?

23 Q. Okay --

24 A. But we've already established
25 that there's an onset temperature that goes

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1 from Stage 1 to Stage 2, right? I don't
2 think anybody disputes that. The above 80
3 to 90 degrees Celsius-ish that the battery
4 will begin to generate their own heat.

5 In fact, like the arc testing
6 that, you know, one of these citations that
7 I -- that I referenced is, you know,
8 excelling rate calcimetry. That only
9 applies heat up to the onset temperature.
10 Beyond that, it just basically -- the
11 batteries are in adiabatic condition and
12 they self-heat up to that -- up to the
13 thermal runaway temperature.

14 So the batteries simply needed
15 to be heated up to 80 and 90 -- 80 to 90
16 degrees C and enough heat provided that the
17 thermal -- the temperature can build up from
18 the batteries themselves. So I just want to
19 make sure that we're clear on that, that you
20 don't need to get external heating up to
21 that -- that point, that the batteries will
22 self-heat themselves up to thermal runaway
23 if there is no way for the batteries to
24 dissipate that thermal energy.

25 Q. Okay. And I -- and thank you

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1 for that clarification. So you're saying
2 that -- that whatever the heat on the
3 surface and whatever the heat loss as it
4 goes from material to the other, once the
5 batteries get somewhere in the 90 to 100
6 Celsius range, they'll start to produce
7 their own heat internally?

8 A. Correct.

9 Q. And I believe you said
10 previously in your testimony that the
11 beginning of that process is -- is a slow
12 one, and as the temperature rises, it -- it
13 -- the -- the change in temperature per
14 second increases until it gets to the point
15 where it becomes very rapid after
16 200 degrees Celsius; is that true?

17 A. Well, you know, very slow
18 versus, you know, it's as the temperature
19 increases, the rate of temperature rise
20 increases, right?

21 Q. So what is -- what is the -- the
22 typical -- once you get to 90 to -- let's
23 say 70 to 90 degrees Celsius, what is the
24 rate of change of temperature from a thermal
25 runaway that's -- reaction that starts over

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1 the first 50 degrees, say, from -- from 100
2 to 150? How quickly does that happen?

3 A. Well, you're really doing a
4 great job at testing my -- my -- my memory
5 skills. I -- I -- I can't remember what,
6 you know, off the top of my head what the
7 degrees C per minute is -- is -- is going to
8 be, what that temperature rise is.

9 Q. Do you have a range?

10 A. I -- I -- off the top of my
11 head, I -- I really don't want to -- to
12 throw numbers out, you know, that could,
13 but, you know, all -- what I'm saying is
14 that, you know, you initially said, well,
15 the computer -- the top of the computer has
16 to be hotter than the battery in order to
17 get the battery to go into thermal runaway.

18 I clarified that, no, that's not
19 the case, because once you heat the battery
20 up to the point where the battery starts to
21 generate its own heat, as long as the
22 battery cannot dissipate that heat as fast
23 as it's being generated. The battery will
24 continue to self-heat itself up. The rate
25 at which it does that is going to depend a

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1 lot on how much more heat is going into how
2 much, you know, how insulated the battery
3 is, how much heat can be -- can come out it,
4 all those things.

5 So it's -- I can't put a number
6 on that, but I can -- I can -- but I can
7 qualitatively say that those are things that
8 you consider when you're looking at how fast
9 it's going to, you know, take, you know, how
10 long it's going to take for the battery to
11 have a thermal event.

12 Q. And I think you said -- so
13 again, I think your testimony before was, at
14 the beginning, the generation of heat, once
15 you get to that 70 to 900-degree temperature
16 rage is -- is much slower than it is later
17 in the reaction; is that a true statement?

18 A. As you increase the temperature,
19 the heating -- the self-heating rate of the
20 battery increases.

21 Q. Right. And I think if you read
22 the Sorensen paper, there's a graph that
23 shows that -- that the temperature goes up
24 rather slowly and then it gets to 200 and
25 then it shoots up at a tremendous rate; do

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1 you recall that? I can show you the graph,
2 but --

3 A. Well, let's -- if you're going
4 to --

5 MS. WANEMAKER: Yeah.

6 A. -- bring it up, why don't you
7 show it to me and just -- we're -- we're
8 clear on -- on everything.

9 Q. Okay.

10 MS. WANEMAKER: Do you want to
11 take a little break before we do that?
12 It's been about an hour and 15
13 minutes.

14 THE WITNESS: Sure.

15 MS. WANEMAKER: Just quick to
16 stretch legs.

17 THE WITNESS: Yeah.

18 THE VIDEOGRAPHER: The time is
19 2:44 p.m., and we're going off the
20 record.

21 (An off-the-record discussion
22 was held at this time.)

23 THE VIDEOGRAPHER: The time is
24 2:54 p.m., and we're back on the
25 record.

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1 Q. Okay. Dr. Horn, I've marked the
2 Sorensen article, which is Tab 14 of your
3 binder, as Exhibit 9, and that was what we
4 were talking about. There's a graph on the
5 second page of that article, which is Page 2
6 of 16, that I wanted to look at, and you
7 said you had looked at it and we wanted to
8 look at it together.

9 (Exhibit 9, Sorensen Article,
10 was received and marked for
11 identification by the reporter.)

12 A. Yes, I have it.

13 Q. Now, this graph has -- has -- in
14 the X axis is temperature, and on the Y axis
15 is rate of change of temperature; is that
16 true?

17 A. Correct.

18 Q. And it's also a log scale,
19 correct?

20 A. It is, correct.

21 Q. And a log scale is just a way to
22 compress the data so that -- because if
23 there's a great change, it's difficult to
24 graph in -- in one graph. So you compress
25 the scales so that you can get all the data

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1 on one -- one chart, basically -- or you
2 want to give -- why don't you give a better
3 explanation of a log scale than I just did.

4 A. Yeah. I -- I -- a log scale is
5 useful when -- when the change that you're
6 measuring -- in this particular case, you're
7 -- the -- the -- the rate -- the change in
8 the temperature rise as a function of
9 temperature, and you can see from the -- the
10 plot that that occurs over, you know, you
11 know, two to three orders of magnitude.

12 So if you were to do the Y axis
13 on a linear scale, you really wouldn't be
14 able to see much of a change, you know, at
15 the lower temperatures, right? That -- that
16 would -- that would -- that would be kind of
17 compressed. So the log scale gives you --
18 it's -- it's almost the opposite of
19 compression.

20 It kind of expands that so that
21 you can really look at the low rate of
22 temperature rise compared to the high rate
23 of temperature rise over a change in the
24 actual temperature.

25 Does that make sense?

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1 Q. Yes. And thank you. That's a
2 much better explanation than I -- than I
3 tried to provide to you, and I don't know
4 why I tried in the first place.

5 So if we take a look at Figure 1
6 then, which is the one we're looking at,
7 this is -- again, we talked about this
8 previously, but the way that Sorensen, et
9 al. described the thermal runaway process
10 was, there were three phases, right?

11 A. Three -- yeah. Three stages,
12 yes.

13 Q. Stages. I -- I keep calling --
14 phases, they call them stages, and you're
15 absolutely correct, they're stages. So the
16 first stage is the relatively normally
17 operating range of the battery?

18 A. It gets above -- it does kind of
19 get above the normal operating range in the
20 -- of the cell, but yeah. Normal operating
21 range is going to be, you know, they want,
22 you know, you want to be below the onset
23 temperature, right?

24 So the typical normal operating
25 range, the battery is, you know, below 65 or

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1 below 60 degrees Celsius.

2 Q. Okay. And then they -- they
3 demarcate the -- the time when the battery
4 contents themselves start to generate heat
5 as Phase 2?

6 A. Yes, they do.

7 Q. And they -- they indicate that,
8 in their study anyway, that -- that battery
9 -- that heating generating phase begins at
10 about 117 degrees Celsius?

11 A. Correct, yes.

12 Q. And then -- then the temperature
13 starts going up based on heat that's
14 generated by the chemistry in the battery?

15 A. That's correct, yes.

16 Q. Now -- so using this log scale
17 is a little confusing, so I just want you to
18 help explain it to us. So there's a line
19 for -- for when the rate is one degree per
20 minute, that's across -- horizontally across
21 the graph, right?

22 A. Correct.

23 Q. And so everything below that
24 line then is some fraction of a degree per
25 minute?

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1 A. Correct.

2 Q. So up to the 150-degree level
3 approximately, it looks like the rate of
4 change with the heat generated within the --
5 the battery cell at Phase 2 is less than one
6 degree per minute?

7 A. In -- in this type of test -- -
8 that is -- that is correct, and, you know,
9 keeping in mind that, you know, in these
10 types of testing -- in this type of testing,
11 basically, what -- what you're doing is, you
12 are applying heat up until the cell starts
13 to self-heat, and then you stop applying
14 heat and you just basically let the cell
15 heat itself up under adiabatic conditions.
16 So --

17 Q. But we're -- and -- and that's
18 being done, because you want to -- you want
19 to try to measure the amount of heat that's
20 actually generated by the battery contents,
21 not by the heat that might be externally
22 applied?

23 A. That -- that is correct. These
24 -- these, you know, very, very controlled
25 laboratory tests to, you know, extract as

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1 much information as you can get out of
2 what's happening inside the battery. So
3 they -- they -- they take a long time.

4 Typically, accelerated rate
5 calorimetry tests can take a day to two days
6 to -- to perform to -- to really extract
7 that information out that you're looking
8 for.

9 Q. So getting back to my question
10 then, up until 150 degrees, the heat that's
11 generated by the chemistry by the battery
12 once it gets to that first transition point,
13 the rate or change is less than a degree per
14 minute?

15 A. Correct, with -- with -- in the
16 absence of application of additional heat,
17 yeah. That's just the battery generating
18 its own heat under perfect adiabatic
19 conditions.

20 Q. That was the premise of the
21 question, yes. So the answer is, yes,
22 that's -- that's correct, and then when it
23 gets above 150 degrees, the rate of change
24 stays below ten until it gets to somewhere
25 around 180 degrees.

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1 Would you agree with that
2 interpretation, again, with the same premise
3 that this is the heat generated by the
4 battery chemistry itself and not by any
5 external additional heat?

6 A. Yeah. In -- in -- in this
7 particular example, in -- for this
8 particular cell, that -- that's what it
9 shows, yes.

10 Q. So you think that this was just
11 some unique cell that they did and this
12 wasn't meant to in -- indicate what is
13 generally true in thermal runaway in 18650
14 battery cells?

15 A. Qualitatively, qualitatively,
16 this is exactly what one expects, Stage 1,
17 Stage 2, Stage 3. Quantitatively, one would
18 want to know exactly what chemistry was
19 being applied -- was in the cell, exactly
20 the state of charge, the size of the cell
21 can -- can matter as well, the form factor,
22 those types of things, but qualitatively,
23 absolutely, you know, you've got Stage 1,
24 the cell, you can heat it up.

25 It doesn't generate heat up

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1 until the onset temperature when you go into
2 Stage 2. Stage 2, the cell begins to
3 self-heat. If it's in a perfect adiabatic
4 environment, it will continue to self -- it
5 will continue to heat itself up.

6 The rate of temperature rise
7 will increase until you get to the thermal
8 runaway, you know, critical temperature, at
9 which point, the chemistry in the cell
10 begins to react at such a rate that it's
11 essentially unstoppable and will go to
12 completion.

13 Q. Okay. So is your reference,
14 Methodologies For Battery Failure Analysis,
15 does that provide a different rate of
16 temperature at these different phases than
17 this graph does?

18 A. Well, yeah. I mean, you -- you
19 -- one would -- one would want to look at an
20 18650 with the same chemistry at the same
21 state of charge, because, you know, those
22 things -- and -- and also the same energy
23 density, right, because -- absolutely.

24 Those specific numbers, as far
25 as picking a specific temperature and

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1 picking -- and looking -- looking a
2 particular -- a specific rise, that -- that
3 point that you're -- that you're looking at,
4 is going to be dependent on the cell
5 chemistry, the state of charge of the cell,
6 as well as the specific design of the cell
7 as well. So, yes. I mean --

8 Q. So it's --

9 A. It -- it will be different, and
10 that's why people do the arc testing,
11 because if it was just, like, we -- then
12 otherwise, we would only need to do one cell
13 and then that would apply to everything, but
14 that's not the case, right?

15 Q. So --

16 A. You have to look at the, you
17 know, if you're looking at -- if you want to
18 say, well, at 150, it's ten degrees C per
19 minute for that cell, that's true, right?
20 For that cell under these conditions, at
21 that particular state of charge, that's
22 right, right?

23 So it can -- it will -- it will
24 be different for a different cell using
25 slightly different materials, a different

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1 cell design, a different energy density, a
2 different state of charge, it would be
3 different.

4 Q. Okay. The question I was trying
5 to interpose while you were giving that
6 answer was, what data or references did you
7 utilize when you came to your opinion that
8 once the temperature of the battery pack
9 from the radiant heat got to 90 degrees,
10 that what the rate of change of the inside
11 of the battery cell was after that point?

12 What data did you rely upon?

13 A. I don't think that anywhere in
14 my report I -- I -- I speak to that other --
15 other than the fact that we know that with,
16 you know, convectional lithium ion cells,
17 when you're above, you know, in the 80, 90
18 degrees C area, that the cells begin to
19 self-heat. So --

20 Q. Right. But this -- this graph
21 indicates that the rate of change up to 150
22 degrees is -- is less than one degree
23 Celsius per minute.

24 So I'm just saying, did -- you
25 must have looked at some other data that

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1 indicated that the rate of -- of increase of
2 temperature is much faster than that.

3 A. Why -- why -- I don't understand
4 why you would -- you would assume that.

5 Q. Well, because you said that all
6 the -- the radiant heat had to do was raise
7 the level of temperature in the batteries to
8 the threshold of when heat started to be
9 generated from the batteries, and then the
10 batteries would -- would heat themselves to
11 the point of thermal runaway, so radiant
12 heat didn't have to provide heat all the way
13 up to 200 degrees Celsius; do you recall
14 that?

15 A. I -- I -- we probably need to
16 get the reporter to go back to that. I
17 don't -- I don't think I said that
18 specifically.

19 What I said was -- and just make
20 sure that I clarify this, you had said that
21 you need to have a temperature of the
22 surface of the computer hotter -- that was
23 hotter than the battery itself. I said that
24 you were neglecting the fact in that
25 question that the batteries are producing

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1 their own heat.

2 So now, you have both the heat
3 coming down on top of the computer, the
4 radiant heat heating the surface of the
5 computer, which is then heating the
6 batteries by -- via conduction. Plus, you
7 have the batteries heating themselves up.
8 So now, you have an internal source of heat
9 versus an external source of heat, and I'm
10 sorry if I was not clear on that.

11 I didn't say that -- I don't
12 believe I said -- and we can go back and
13 take a look. I don't believe I said, you,
14 you know, shut off the radiant heat. You
15 could shut off the radiant heat and it's
16 going to take a long time assuming perfect
17 adiabatic conditions.

18 It will -- it's -- it's slow.
19 Once you turn off the external heat source,
20 which is what the arc testing does, this
21 test, which is in this report, shuts off the
22 external heat at the point of the onset. So
23 at that point, the only source of heat is --
24 the heat from -- that's being generated
25 internal to the battery, okay?

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1 Keep in mind, nobody is saying
2 that, suddenly, the computer is pulled out
3 of the office and set on -- on the side and
4 it's heating itself up. There is still heat
5 coming from the radiant heat source. So
6 this is a great study.

7 It shows phenomenologically what
8 happens in -- in a 18650 cell, right -- or
9 in fact, I don't know that this is actually
10 an 18650, but generally, this is what
11 happens in lithium ion cells, Stage 1, Stage
12 2, Stage 3. The purpose of this is to show
13 that once you get above a certain onset
14 temperature, the cell begins to generate its
15 own heat.

16 So from the incident situation
17 -- now, you've got two sources of heat from
18 the battery cell perspective. You've got
19 the heat that's being applied from the
20 external heat source and you have the heat
21 that's being generated from the cell.

22 Q. I understand that completely.
23 That wasn't my question, but thank you for
24 that long answer.

25 So the battery internal contents

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1 have to get to 200 degrees Celsius, correct,
2 approximately?

3 A. 180, 190, yeah. That -- right
4 in there.

5 Q. And -- and what you're saying is
6 that that heat to -- to cause the internal
7 battery components to get to 200 degrees
8 Celsius can come from two sources, the
9 external heat, plus the heat that starts to
10 be generated by the battery?

11 A. Correct.

12 Q. Now, what this indicates,
13 though, is that the heat that's generated by
14 the battery at the early part of that Phase
15 2, is a relatively slow generation of heat,
16 correct?

17 A. At -- at the beginning of the
18 Stage 2, it -- it -- it -- it I mean, it's
19 -- it is a small amount of heat at the
20 beginning of Stage 2, which is why if you --

21 Q. But just -- just --

22 A. -- why if you review the
23 external heat source --

24 Q. Yes, is the answer.

25 A. It takes a long time -- it takes

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1 a long time to get to that.

2 Q. Yes is the answer. At the
3 beginning, the internal heat generated by
4 the battery in thermal runaway goes
5 relatively slowly, and in this study, it was
6 less than a degree per minute?

7 A. At -- at the onset in the
8 absence of any additional external heat
9 source.

10 Q. Right. So -- so under your
11 theory then, you have the radiant heat
12 that's heating the computer and -- and
13 heating the top of the computer to a certain
14 temperature. Then as that heat is
15 transferred downward, there's some loss and
16 some differential between the surface
17 temperature and the outside of the battery
18 pack, at least, is going to occur there,
19 correct?

20 There's going to be some loss of
21 temperature of the heat source from the
22 external source, because it's got to go
23 through three layers of plastic?

24 A. Initially, until the cell --

25 Q. Yes. Just talking -- I'm just

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1 talking about the external component of
2 what's being transferred. In other words,
3 that's all I'm asking right now. The
4 external component that -- the source that
5 you say from the unknown prior -- from the
6 unknown source is what we're talking about
7 here that was applied in radiant energy to
8 the top of the laptop.

9 That component is going to be
10 some level of degrees less than the
11 temperature of the surface of the laptop for
12 that component only?

13 MS. WANEMAKER: Object to the
14 form.

15 You can answer.

16 A. Up until the cell hits the --

17 Q. Just -- just answer my question.
18 I'm -- I'm -- we're dividing -- I'm not
19 saying that the temperature of the cell will
20 be that temperature. I'm talking about the
21 contribution of heat from the -- the radiant
22 energy that goes through the -- the three
23 layers of plastic before it gets to the
24 cell.

25 That component is going to be

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1 less heat at the level of the cell than it
2 was at the surface, not -- not including the
3 internal temperature, which we're going to
4 talk about?

5 A. Counselor, you're -- you're --
6 I'm sorry, you're not talking my language,
7 and I --

8 Q. I'm sorry --

9 A. I got ---

10 Q. Let me -- that's okay, I'll just
11 rephrase it. So let's just use numbers.

12 If the -- if the temperature of
13 the surface of the laptop at the -- at the
14 keyboard level from radiant heat reaches 200
15 degrees Celsius, okay, assume that that's
16 possible. Is that 200 degrees Celsius
17 temperature energy going to entirely be
18 transferred to the battery cell?

19 A. Counselor, again, you're not
20 talking my language. So let me -- let me --
21 let me -- I believe what you're saying is
22 that there is a thermal gradient initially,
23 because you have external heat source
24 impinging on the surface of the computer,
25 right? The keyboard area of the computer,

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1 right?

2 We all know that there is,
3 because there's melting on the top of the
4 computer, fine. There's an external heat
5 source impinging on the surface of the
6 computer. The batteries are inside the
7 computer. So for the batteries to heat up,
8 heat has to get transferred from the surface
9 of the computer to the cells.

10 There is going to be a thermal
11 gradient, a temperature gradient, if you
12 will, between the surface and -- and the --
13 and the cells. Initially, the cells will be
14 cooler than the surface. That holds true up
15 until --

16 Q. Okay --

17 A. -- onset temperature --

18 Q. All I wanted --

19 A. -- self-heat --

20 Q. Okay --

21 A. -- at that point, then it can
22 reverse, right? The cells become -- the
23 cells can get to a higher temperature than
24 what is actually at the surface, because the
25 cells are generating their own heat at that

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1 point, right?

2 Q. You're getting ahead of me.

3 Okay. So at the beginning, though, the
4 component that's coming internally from the
5 cells, according to Sorensen and according
6 to what you're saying is well-known, is the
7 rate of change of increase from the internal
8 temperature from the battery chemistry going
9 into thermal runaway, is a slow gradient
10 until it gets to a certain point where it
11 starts to get to, you know, ten degrees per
12 minute, and then eventually, it goes up to
13 1,000 degrees per minute once it gets into
14 Phase 3?

15 MS. WANEMAKER: Objection to
16 form.

17 You can answer if you're able.

18 A. I -- I -- I can't. I -- I don't
19 even know what the question is. I'm sorry,
20 sir --

21 Q. That's okay --

22 A. I don't --

23 Q. You're doing your best to
24 obfuscate, that's fine. What I'm trying to
25 get at --

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1 A. Sir -- sir -- sir -- you are --
2 you are mischaracterizing my testimony --

3 Q. Okay. Well --

4 A. -- and that is not -- that is
5 not --

6 Q. I'm sorry --

7 A. I am doing my best to give you
8 an honest and -- and technically correct
9 answer to your question. You are asking me
10 questions that are not the way that a
11 technical person would ask them, all right,
12 and I'm giving you technical answers back to
13 you, which for whatever reason, you're not
14 liking.

15 So I'm doing my best. I am not
16 obfuscating. Let's make the record clear on
17 that, and I --

18 Q. I think the record is clear on
19 that.

20 A. Quite frankly, I am offended
21 that you would say I'm trying to obfuscate.

22 Q. Okay. Well, I'm sorry. I
23 didn't mean to offend you, but if you would
24 let me ask questions and you would answer
25 them, I promise I won't offend you anymore.

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1 A. I am doing my best to answer you
2 in --

3 Q. Okay. We'll, I'm doing my
4 best --

5 A. -- correct way I can. I am not
6 obfuscating.

7 Q. Okay. Doctor, the rate of
8 increase temperature produced by the battery
9 themselves is less than one degree per
10 minute until approximately 150 degrees
11 Celsius, assuming there's no additional heat
12 produced by the external heat source,
13 correct?

14 A. In that particular plot, that --
15 in that particular test, yes.

16 Q. Okay. Tell me what other data
17 you have that would show a different rate of
18 increase in that initial stage of thermal
19 runaway.

20 Do you have a reference of
21 another test that you're relying upon that
22 says that in a different circumstance, that
23 rate of change would be different?

24 A. Well, I would -- I would -- I
25 guess I would probably just point to the

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1 Larson paper, which is what Martin points
2 to.

3 Q. So you would -- you would point
4 -- again, I'm just asking you -- in other
5 words, you didn't have the Larson paper when
6 you came to your conclusions here as to the
7 -- the cause of the therapy runaway here.

8 You assumed that it was radiant
9 heat, and I'm just trying to get the basis
10 of your assumption of how the radiant heat
11 caused the cells to get to over 200 degrees
12 Celsius.

13 Did you have any references
14 other than something that was cited by the
15 other expert that you relied upon?

16 A. Counselor, the surface of the
17 computer got well-above 200 degrees Celsius,
18 right?

19 Q. Okay.

20 A. Even if the batteries did not
21 self-heat, that would be sufficient, because
22 we know what the melting point is of the --
23 of the polymers that comprise the keyboard.

24 So if the polymer -- if the
25 surface of the computer is above the -- the

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1 thermal runaway temperature, then certainly,
2 there is a high likelihood that the cells
3 are going to get to the thermal runaway
4 temperature. That is ignoring the fact that
5 the cells are going to produce their own
6 heat, right?

7 So we know that the surface of
8 the computer got above those temperatures,
9 we know that the cells are going to generate
10 their own heat. It's pretty basic stuff.

11 Q. I have a question. Can I impose
12 a question? You ready? Okay.

13 When in the course of the fire
14 did the melting of the keyboard occur? In
15 other words, how long after the initiation
16 of the fire was the heat layer sufficient to
17 melt the keyboard?

18 A. I, you know, I don't know -- I
19 don't think anybody knows exactly when the
20 fire started. All we can really point to is
21 the fact that Ms. Marcellin observed, you
22 know, projectiles coming out of the computer
23 when she first walked into the -- into the
24 office and -- and looked at the conditions.

25 At which point, if you look at

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1 her declaration, the fire had already been
2 well-underway, you know, by her observations
3 of blackening of the -- of the armoire and
4 -- and the walls and so, you know, I don't
5 know exactly when it happened, but what we
6 can say is that it certainly did happen at a
7 -- a certain point, that the cells in the
8 computer got hot enough to begin ejecting
9 their contents.

10 Q. Okay. That's what I'm trying to
11 get at. In other words, you were of the
12 opinion that the temperature that caused the
13 cells to go into thermal runaway occurred at
14 the time that the keyboard was melting?

15 A. Correct, yes.

16 Q. Okay. And -- and what I'm
17 asking you is, how do you know the damage to
18 the keyboard happened at the time that
19 Ms. Marcellin was -- was in the room -- it
20 would have to be before she was in the room,
21 and -- and how do you exclude that that
22 melting of the keyboard happened at some
23 later point after she left the house, after
24 the fire increased in temperature, increased
25 in -- in size and -- and the thermal layer

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1 came down lower?

2 How do you -- how did you make a
3 determination that the keyboard melted
4 before Ms. Marcellin came into the office?

5 A. The fire had already -- had
6 already begun and -- and reached to the
7 point where there was enough smoke to
8 activate smoke detectors on the opposite
9 side of the house, is my understanding, and
10 Ms. Marcellin observed projectiles coming
11 out of the computer, which means that the
12 cells were already engaged in a thermal
13 event substantially after the fire had
14 started.

15 Q. Okay. Well, at least one cell
16 was engaged in a thermal event. You don't
17 know how many were going off that she
18 observed, did you? Did -- were you able to
19 tell from her testimony how many cells were
20 ejecting their contents when she observed
21 it?

22 A. She said projectiles were being
23 emitted from the computer, so that's more
24 than one.

25 Q. Right. Well, you said that the

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1 internal components can break into many
2 pieces and be ejected; do you remember that?
3 You called it confetti.

4 A. Yes.

5 Q. And -- and those would be super
6 heated pieces of metal that would come out,
7 correct?

8 A. I don't know what you mean by
9 "super heated," but --

10 Q. They would be very high
11 temperature and -- and probably give off
12 photons, because of the temperature they're
13 at so that you would see them. Just like
14 embers give off photons.

15 A. Again, you know, she's said
16 there were projectiles being, you know, from
17 -- from the computer.

18 Q. Right. So from her testimony,
19 you're able to tell that that was multiple
20 cells going into thermal runaway that she
21 was observing?

22 A. Projectiles coming from the
23 computer.

24 Q. So if -- if one cell was
25 shooting projectiles from the computer, how

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1 would that be described differently?

2 A. Sir, all -- all -- that's --
3 that's -- that's what I said, and -- and
4 again, you know, you don't look at any one
5 piece of evidence or eyewitness testimony in
6 a vacuum. You look at the entire incident,
7 and --

8 Q. And so what from the entire
9 incident allows you to provide a -- a
10 scientific opinion that the keyboard melted
11 before Ms. Marcellin got into the room other
12 than your assumption that it was an external
13 heat source that provided the -- the heat to
14 cause thermal runaway?

15 Other than that fact, what other
16 facts do you have that you could point to
17 that says that that keyboard melted before
18 Ms. Marcellin came into the room?

19 A. Well --

20 MS. WANEMAKER: Objection to the
21 form.

22 You can answer if you're able.

23 A. She -- she -- she stated that --
24 that there was blackening of the armoire and
25 blackening coming down from the walls, which

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1 means there was a significant amount of
2 radiant heat already being applied to -- to
3 the -- to the computer, and -- and if the --
4 if an initiating cell ejected itself from --
5 then -- then -- it would not have started
6 the fire in the computer, right? So the
7 fire from the batteries has to be from the
8 outside in.

9 Q. So you're saying that it -- when
10 a cell goes into thermal runaway, no flames
11 are produced from the cell?

12 A. When it ejects its contents,
13 that is correct. It is far worse from a
14 fire perspective for the cell to not eject
15 its contents, because then the -- all of the
16 fuel burns to completion. That's when most
17 of the heat is -- is generated.

18 When it ejects its contents --
19 especially if it ejects its contents as we
20 know that these did, which is basically
21 confetti, the cell -- all those super thin
22 foils just kind of break up into the air.
23 There's no heat load there, there's no
24 thermal load there.

25 So it doesn't actually project,

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1 you know, a lot of thermal mass into the
2 room. When a cell does not eject its
3 contents, that's when it is much more likely
4 to initiate a fire, which will cascade to
5 other cells in the pack and start other
6 things on fire.

7 Q. So a cell that doesn't eject its
8 contents and remains in place is more likely
9 to start a fire than the cell that ejects
10 its contents into the room and could hit a
11 flammable object; is that what you're
12 saying?

13 A. Generally speaking, that is the
14 case, unless the cell expels its entire
15 electrode winding intact, which is not the
16 case in this situation.

17 Q. And what is the -- do you have a
18 -- some research that you can point to that
19 indicates what you just said, that supports
20 that other than your expert opinion?

21 A. I -- I would say that's based
22 on, you know, basic science and -- and my
23 25 years of doing battery failure analysis.

24 Q. Now, there's -- there are
25 literally hundreds of published articles

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1 about fires and fire risk of lithium ion
2 battery thermal runaway, correct?

3 A. There are, yes.

4 Q. And there must be then, hundreds
5 of articles that support what you just said?

6 A. You know, very few -- very few
7 academics actually report on these very
8 practical matters, but I don't think that
9 there's anybody that would disagree with the
10 idea that if you keep all of the fuel in the
11 can to burn to completion, you are going to
12 generate the highest temperatures at that
13 point.

14 If you eject the fuel from the
15 can and disburse it into the air, you are
16 going to have a much less likely chance that
17 you are going to ignite something, because
18 the thermal load is not -- it -- it's just
19 -- the thermal load -- any particular piece
20 of that confetti, if you will, is -- is to
21 -- is -- is not sufficient.

22 At that point, I'm going to say,
23 you should probably talk to somebody like
24 Tim Myers, you know, and fire cause and
25 origin guys, and things -- and -- and those

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1 guys.

2 Q. How about Mr. Gorbett, who was
3 actually on the scene and observed all that,
4 he would be a good person to talk to, right?

5 MS. WANEMAKER: Asked and
6 answered. We've been through this
7 many times.

8 Q. You can answer it.

9 A. I -- look, you're -- you're --
10 you're getting into the point where -- where
11 we're getting out of the battery failure
12 analysis, and the technical aspects of the
13 battery, and how batteries fail, and what
14 happens to batteries under different
15 conditions, and you're getting into fire
16 cause and origin, which I have said from the
17 very beginning is, you know, outside of my
18 bailiwick.

19 Q. Okay. I want to just share the
20 screen for a minute. I want to just ask you
21 to confirm something, because I didn't mark
22 this and I apologize.

23 Can you see that?

24 A. Yes, I can.

25 Q. Is that the reference that you

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1 had in your materials as the -- one of the
2 references that you used to support your
3 opinions?

4 A. It is, yes.

5 Q. Okay. I just wanted to confirm
6 that, and we've marked that as Exhibit 10
7 and that's the Appendix H, Methodologies For
8 Battery Failure Analysis.

9 (Exhibit 10, Methodologies For
10 Battery Failure Analysis, was received
11 and marked for identification by the
12 reporter.)

13 And you're saying that -- that
14 -- things in this document are
15 supportive of your opinion that you
16 stated today that in any thermal
17 runaway reaction where the battery
18 contents are expelled, it is far more
19 likely than not that it was an
20 external heat source that caused the
21 thermal runaway rather than some
22 internal overcharge, overvoltage-type
23 situation, correct?

24 A. Yes.

25 Q. And that's in this document?

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1 A. It -- it is. I believe that
2 there is a paragraph -- that -- that
3 mentions that when a battery expels its
4 contents, that it is likely from external
5 heat source.

6 Q. Okay. And is it to say it's
7 likely or it's -- I think you said in the
8 vast majority of circumstances, it has to be
9 from external heat; do you recall which one
10 it was?

11 A. Counselor, you've got the
12 document here. Let's go to the paragraph
13 and we can see what it reads.

14 Q. Do you know where that paragraph
15 is?

16 A. I don't --

17 Q. Say --

18 A. I don't recall off the top of my
19 head, Counselor.

20 Q. It's a 35-page document, that's
21 why I think it will take quite a while to
22 find it, but we'll find it and if it's -- if
23 it's there, I'll be able to read it later,
24 and if not, we can deal with it on the
25 motion.

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1 Now, you said that you didn't
2 look at the Matterport photographs of the --
3 of the rooms where the fire occurred?

4 A. Yes. That's -- that's what I
5 said.

6 Q. And did you look at
7 Mr. Karasinski's rebuttal report, where he
8 measured different markings, lines of
9 demarcation in the -- in the office and the
10 other parts of the building.

11 A. I -- I saw that he did that,
12 yes.

13 Q. And did you ever do anything
14 like that to look at how far the thermal
15 heat layer came down to make your estimate
16 that radiant energy from the thermal heat
17 layer was sufficient to increase the heat of
18 the battery pack into thermal runaway?

19 A. No, Counselor. I'm not a fire
20 cause and origin person. That's beyond my
21 -- my -- my expertise to -- to do that.

22 Q. Well, the fire and origin person
23 said that you would be able to answer how
24 you estimated the temperature of the thermal
25 heat layer being sufficient to produce

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1 radiant energy to put the battery pack into
2 thermal runaway.

3 Are you saying that you didn't
4 do any analysis of that aspect?

5 A. No, sir. I -- I -- I don't know
6 -- no -- no, sir. That's -- that's -- I --
7 I'm not a fire cause and origin person. So
8 what I can tell you is what the, you know,
9 the minimum surface temperature that the --
10 the surface of the computer got to and what
11 -- what the temperature it's going to take a
12 cell to go into -- have a thermal event and
13 look at the -- at the evidence of what the
14 cells looked like after the thermal event
15 and look at that in totality from a battery
16 failure analysis. As far as --

17 Q. So --

18 A. As far as looking at the scene
19 and -- and -- and -- and, you know,
20 measuring temperatures based on damage
21 patterns in the -- in the room and things of
22 that nature, again, you -- that's not my
23 bailiwick.

24 Q. Okay. But -- but you did say
25 that you were able to determine the

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1 temperature that the keyboard surface
2 reached?

3 A. At a minimum based on the
4 melting point of the -- of the plastics that
5 composed the -- the keyboard, yes.

6 Q. And -- and that would be -- that
7 would be heat that you're attributing to the
8 thermal layer radiation, not to heat
9 generated by the thermal runaway reaction,
10 right?

11 A. Correct, because the thermal
12 runaway would have been local to the
13 batteries, and so, you know, you do see some
14 melting on the bottom of the computer.

15 That would have been due to the
16 -- due to the thermal events, you know, with
17 the -- with the batteries, but, you know,
18 from the surface, that would be, you know,
19 my -- that would be from the -- the heat
20 from the room from the fire itself.

21 Q. So I think you got a photograph,
22 let me find it. Maybe you don't. I think
23 you have a photo of the actual laptop that
24 you look -- you put in your report, didn't
25 you?

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1 A. I can go to my report and -- and
2 look through it, if you'd like.

3 Q. I've -- I've got -- not the
4 best, but I got one. If you look at Page
5 15, Figure 4, there's a photograph of the
6 laptop.

7 A. Correct.

8 Q. Now, the damage to the keyboard
9 is -- and -- and the surface of the laptop
10 that has the keyboard on it, is not uniform,
11 correct?

12 A. I -- I -- I don't understand
13 what --

14 Q. Let me -- let me rephrase it a
15 different way.

16 If you look at the upper-right
17 part of the -- above the keyboard before you
18 get to the screen, above the battery
19 component -- compartment on the right side,
20 would you agree that there's significantly
21 more plastic deformation there than there is
22 near the touch pad?

23 A. Yeah -- well, what I would agree
24 with, Counselor, is that that is where the
25 cells ejected themselves from -- from the

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1 computer.

2 So there is certainly going to
3 be a combination of thermal damage due to
4 the softening of the plastic, as well as
5 mechanical damage due to the -- forced the
6 ejection of the -- of the cells from the
7 battery compartment.

8 Q. So that's what's I'm getting at.
9 In other words, that area was damaged by not
10 only the thermal layer, but also by the heat
11 and mechanical energy that was created by
12 the expulsion of the -- the cells out of the
13 battery pack, correct?

14 A. Yes. If you're referring to the
15 damage directly above the battery
16 compartment where the battery -- where the
17 battery cells ejected themselves, correct.

18 Q. So that's what I -- I wanted to
19 sort of exclude that area, because that had
20 multiple different components to it and just
21 look at the rest of the -- the surface that
22 -- that the keyboard is on, and if you
23 exclude that area then, the rest of the
24 surface, you believe, was damaged by radiant
25 heat, correct?

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1 A. That's my understanding,
2 correct.

3 Q. Well, that's your opinion?

4 A. Yes.

5 Q. Okay. And -- and the question I
6 asked you before, I just want to ask you
7 again is, when in the course of the fire did
8 that damage -- other than the -- the thermal
9 runaway compartment damage, when did that
10 damage to the keyboard that you say happened
11 from radiant heat, when in the course of the
12 fire did that happen?

13 Did it happen at the beginning
14 of the fire, or when it got to its peak, or
15 at some point in between?

16 A. You're asking questions that are
17 outside of my -- my -- my area of expertise,
18 sir. All -- all I can say is that, you
19 know, we know that the, you know, the
20 surface of the computer got -- the keyboard
21 got to, you know, temperatures that are
22 well-above what is required to, you know,
23 get lithium ion cells to begin to self-heat
24 and reach the, you know, critical
25 temperatures for thermal runaway.

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1 When it happened, that's a
2 question for -- for the -- your fire cause
3 and origin guys.

4 Q. So just to be clear, you can't
5 look at the surface of the -- the computer
6 and the keyboard, and tell me that it had
7 that degree of fire damage or heat damage at
8 the time that Ms. Marcellin saw the -- the
9 ejectile -- projectiles coming out of the
10 computer, except for your assumption that it
11 had to have occurred before that in order to
12 put the -- the cells into thermal runaway;
13 is that true?

14 A. Yeah. The heat from the fire
15 would have to have -- yeah, gotten the cells
16 to the point where they were going to --
17 into thermal runaway and expelling their
18 contents, yes.

19 Q. All right. So your -- your
20 premise is that because these cells could
21 only have gotten into thermal runaway by
22 external heat, because of all the things we
23 talked about before, then if that is a true
24 statement, then you're saying that the
25 keyboard would have to have been damaged to

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1 this degree by the time the cells went into
2 thermal runaway?

3 A. I don't know necessarily that it
4 would have to have been damaged to this
5 degree, but it would of had to have been,
6 you know, subjected -- it would have likely
7 been subjected to temperatures above
8 200 degrees Celsius, yes.

9 Q. But -- but that's, I guess, the
10 question. In other words, is it because
11 you're looking at the deformity of the
12 keyboard that you can say that the keyboard
13 got this way before thermal runaway or is it
14 because of your assumption based upon your
15 state of knowledge that it's impossible for
16 thermal runaway to occur where you get the
17 ejections from anything other than external
18 heat, that therefore, it must have been that
19 hot to -- to cause this damage to the -- the
20 keyboard.

21 I'm trying to understand whether
22 -- whether you're saying that -- you're --
23 you're bootstrapping your opinion of when
24 the keyboard got deformed to when the
25 thermal runaway occurred, because you

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1 believe thermal runaway could only have
2 occurred from the external heat source?

3 A. No. I -- I appreciate that, and
4 you -- you do -- you do have a tendency to
5 -- to -- to pick pieces of evidence in -- in
6 a vacuum.

7 I think, you know, one of the
8 things that we have to always remember is
9 that if -- if indeed a particular cell
10 ejected its contents in the room prior to
11 there being any fire, it would have
12 generated a substantial amount of noise.

13 Again, these things are like
14 gunshots going off. Nobody reported any
15 kind of explosion, or sound, or anything at
16 the beginning of this event. It wasn't
17 until the smoke detector went off. So
18 there's no evidence.

19 There would have been a -- an
20 acoustic signature, that was not observed.
21 Also the fact that we have multiple cells
22 that have experienced, you know, an ejection
23 and rupture events, and we see that there is
24 sub, you know, if -- if -- if there was not
25 enough thermal damage to the computer that

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1 would have caused the cells to go into
2 thermal runaway, that would be one thing,
3 but there clearly is.

4 So when you look at all of this
5 evidence in totality, all right, it is
6 absolutely more consistent than not, with
7 the batteries failing from external heat
8 source versus any kind of an internal
9 failure of -- of the cell. So again, we
10 want to look at all the evidence in
11 totality, not just picking one thing at a
12 time.

13 Q. I think what you just said is
14 that when a cell goes into thermal runaway,
15 there's a gunshot-like sound that goes off
16 that can't be missed by anyone?

17 A. I didn't say that. I said, when
18 a cell ejects its contents, to the extent
19 where either the cell can ruptures or the
20 crimp releases with such energy that it
21 blasts its way through the housing of the
22 computer, right?

23 That's an incredibly energetic
24 event. It is extremely loud. Again, if you
25 go back to the standards, the standards will

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1 tell you that when you're doing tests --
2 when you -- when you anticipate that their
3 could be an explosive event of a cell, that
4 personal protection, including hearing
5 protection, is required. It is very loud.

6 I've been -- I've done this --
7 these tests hundreds of times. It is like a
8 gunshot going off in the room. It can't be
9 missed.

10 Q. So if it can't be missed and
11 these cells had that explosive experience,
12 then where in Ms. Marcellin's testimony does
13 she recall any explosive sound that would be
14 consistent with your opinion that it always
15 makes a sound like a gunshot that can't be
16 missed?

17 A. You know, she didn't mention it,
18 but nobody asked her about it, which, you
19 know, but you can't -- it's -- it's -- it is
20 impossible. I mean, think about it. These
21 cells will rupture.

22 The steel can ruptures at
23 pressures well-above 1,000 PSI, you know,
24 your car tires are pumped up to around 35
25 PSI. We're talking about very high

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1 pressures, very energetic explosion of
2 contents, and it is extremely loud, and I
3 don't think that anybody could -- would --
4 would dispute that, that that is --

5 Q. Okay.

6 A. -- going to be a very, very loud
7 event.

8 Q. So -- so here's the question, I
9 guess, if that loud event occurred,
10 Ms. Marcellin didn't say anything about it,
11 correct?

12 A. That -- that's correct. She --
13 she woke up due to the fire, the smoke
14 detector, which would imply that the cells
15 had not yet ruptured and expelled their
16 contents at the point where she was woken
17 up.

18 Q. And then she goes -- is in the
19 house and goes and gets the fire
20 extinguishers, and she witnesses thermal
21 runaway, which you say is the expulsion of
22 the internal contents of at least one of the
23 cells, correct?

24 A. She, I believe in her
25 declaration, which I don't have in front of

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1 me, I believe she used the word
2 "projectiles."

3 Q. Okay. But is that -- what
4 you're saying is that at that point, that's
5 when the loud gunshot must have gone off?

6 A. One -- one would be hearing
7 noise -- loud -- loud noises from the
8 expulsion of the contents, yes. There's no
9 -- if -- if she has seen projectiles, there
10 is going to be very loud noises.

11 Q. Right --

12 A. You -- you cannot rupture the --
13 a cell like this and not have -- and -- and
14 have it be quiet. It's -- it's just not
15 possible. There -- it's -- it's incredibly
16 energetic and incredibly loud.

17 Q. But there's no mention in any of
18 the statements that she gave the night of
19 the incident, or in her deposition, or in
20 her declaration of a loud noise or multiple
21 loud noises.

22 She describes many things, but
23 she doesn't describe that, and your
24 explanation for that is because she wasn't
25 asked?

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1 A. That's the only explanation I
2 can -- I -- I can give, because it's simply
3 not possible for a cell to expel its
4 contents and do it quietly.

5 Q. Okay. So theoretically then,
6 there could have been a gunshot that
7 happened before Ms. Marcellin got up that
8 she didn't get asked about either, right?

9 A. Well, she said she was awoken
10 from the fire -- the smoke detector.

11 Q. Right. Well, you said that --
12 that she wasn't asked the question. Nobody
13 asked the question if she heard a loud noise
14 after she woke up -- or when she woke up,
15 and you're saying that -- that -- that
16 proves that it couldn't have been thermal
17 runaway that caused the fire, and yet, she
18 never mentions ever hearing that sound that
19 you say is inevitable later.

20 So I'm just trying to understand
21 what is the absence of her recollection of a
22 gunshot before she sees the thermal runaway
23 more credible to you as -- as an important
24 fact to consider than the absence of her
25 ever saying she heard the sound that you say

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1 is inevitable.

2 A. Because she would have said that
3 she was awoken by a loud noise equivalent to
4 a gunshot or something similar, as opposed
5 to being woken by the smoke detector.

6 Q. And -- and then a loud noise
7 that you say is sufficient to cause hearing
8 damage if you don't have ear protection
9 would be something that she would not bother
10 to mention if it happened after she woke up;
11 is that what your testimony is?

12 MS. WANEMAKER: Objection to the
13 form.

14 A. I -- I -- I don't know why she,
15 you know, obviously, it was a very traumatic
16 experience for her, but what I'm saying is
17 that if -- if -- if -- the -- if the fire
18 was started by a -- the expulsion of the --
19 the energetic expulsion of an 18650 cell
20 that blew its way through the computer and
21 into the room, it would have made an
22 incredibly loud sound and that's not what
23 was reported. What was -- that's -- that's
24 -- it just isn't.

25 Q. Okay. If you take a look at

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1 Figure 13 of your report, that's on Page 21.

2 A. Yes.

3 Q. That's a close-up of that area
4 that we were talking about just above the
5 keyboard on the right side, where you have a
6 -- an annotation for Cell Number 3, right?

7 A. Correct.

8 Q. So that's one of the ruptured
9 cells that broke through the -- the plastic
10 of the -- of the top of the computer?

11 A. Yes.

12 Q. And there appears to be
13 significant damage to the -- the plastic
14 covering that was above the -- the battery
15 pack, and I believe you said that that
16 significant damage is likely to happen in
17 the thermal runaway event? Let me -- let me
18 phrase that a different way.

19 Is the damage to that -- that
20 area of the top of the computer a
21 combination of what you think the radiant
22 heat and the thermal runaway heat caused to
23 the plastic?

24 A. Yeah. As -- as well -- yes, in
25 addition to whatever mechanical forces were,

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1 you know, you know, imparted due to the
2 expulsion of cell contents, correct.

3 Q. And in -- in the photograph that
4 -- I know it's not your photograph, I think
5 this was -- I'm not sure whose photograph it
6 was. It must have been Mr. Galler's
7 photograph, I guess, because that appears to
8 be his company's name.

9 It appears that the -- the keys
10 closest to that area are more damaged than
11 the keys that are closest to the foreground
12 of the picture; would you agree with that?

13 A. No. I -- I --

14 Q. So you think that's uniform
15 damage to the keyboard?

16 A. Yeah. I mean, there's a couple
17 missing keys there, but that's not
18 surprising that you -- you -- you might blow
19 off a couple keys, you know, because of the
20 -- the shock from the, you know, from the
21 mechanical damage, but as far as thermal
22 damage is concerned that -- it doesn't -- I
23 -- I don't see much of a difference in
24 thermal damage.

25 Q. Okay. Then if you look at the

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1 picture next to it, that's the bottom of the
2 battery compartment, correct?

3 A. Correct.

4 Q. And the bottom of the battery
5 compartment appears to be -- have much more
6 heat damage than the rest of the bottom of
7 the computer, correct?

8 A. Correct.

9 Q. So is it your -- and -- and the
10 radiant heat likely played no role in
11 heating the bottom of the computer, correct?

12 A. Correct.

13 Q. So all of the damage to the
14 bottom of the battery compartment cover or
15 the battery -- actually, the battery pack
16 probably cover that -- that is. That
17 occurred as a result of the heat from the
18 thermal runaway?

19 A. Yes. Likely from Cells 3 and 4,
20 yes.

21 Q. Okay. Now, I think you said
22 that when the cells were ejected that they
23 didn't have enough heat to melt the carpet
24 or anything else, correct? I'll -- I'll
25 take this off the share too, I apologize.

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1 Remember that testimony?

2 A. When the cell ejects the
3 contents, the cell can no longer have --
4 there's no longer a source of heat. So
5 generally, when a cell ejects its contents,
6 the can will not get nearly as hot as it
7 will if the cell does not eject its
8 contents, all things being equal.

9 Q. Okay. And I think it's under
10 your nomenclature or whoever numbered the
11 cells, it's Cell 5 and Cell 6 that ejected
12 their content and went across the room,
13 right?

14 A. Yes. Cells 5 and 6 are the --
15 the cells ejected -- had a crimp release and
16 ejected their contents into the room, yes.

17 Q. And I think you said that if the
18 -- those cell cans were hot, that they would
19 have melted the carpet and that's how you
20 knew that they had cooled before they
21 landed?

22 A. Well, that -- that's one
23 indication, yes.

24 Q. Okay. So take a look at -- at
25 Page 23 of your report, and specifically the

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1 paragraph that you've got written there, and
2 you say -- and this is what was referenced
3 to Cells 5 and 6 that were ejected, and you
4 say, no wrap or residue was observed on
5 either Cell 5 or 6.

6 However, a thick green polymeric
7 residue was observed to be melted to the
8 Cell 6 can. The color of this substance was
9 similar to that of a green melted handle to
10 a bag recovered from the same area of the
11 office as shown on Figure 17, which is
12 another photograph of a green handle of a
13 bag of some sort; you see that?

14 A. Yes.

15 Q. And so what you're saying there
16 is that the cell landed on that bag and
17 melted that material and that fixed to the
18 -- to the cell?

19 A. Correct.

20 Q. And that was the cell that had
21 cooled to the point that it wasn't capable
22 of melting the carpet, is that the same
23 cell?

24 A. Hold on, just a second. I want
25 to make -- what -- there was a -- you had

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1 showed me a photo, and I don't recall which
2 one it was, where you had said that -- you
3 showed me a photo of a cell on carpet, and
4 you said that there was char marks on the
5 upper-left corner on the opening of the
6 cell, and you asked if that had come from
7 that cell, and I said that I -- and I said,
8 no, because there was no evidence of the
9 melting of the carpet on that cell.

10 Can we go back to that?

11 Q. Sure. But I -- I think -- and
12 we will. I promise, but -- but I just want
13 to get clarification --

14 A. I don't -- I'm sorry --

15 Q. First let me ask my question and
16 then we'll go back. I promise we'll go
17 back. We're on this page now and I -- I
18 want to -- both Cells 5 and 6 ejected their
19 content, right?

20 A. Yes.

21 Q. So it really doesn't matter --
22 there's only two cells that ejected their
23 content, 5 and 6?

24 A. That were found outside the
25 computer, yes.

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1 Q. Right. And so -- so the -- the
2 cell that we looked at on the carpet had to
3 be one of those two?

4 A. Correct.

5 Q. Okay. So your testimony was
6 that by the time that cell landed, it was
7 not hot enough to melt anything, and yet,
8 one of the two cells that was ejected --
9 that had ejected their contents was hot
10 enough to melt this plastic bag handle that
11 you've identified and actually made a
12 picture of, of Figure 17, showing that it
13 had sufficient heat at least to do that?

14 A. Well --

15 MS. WANEMAKER: Object to the
16 form.

17 A. Yeah. That cell -- I mean,
18 again, sir -- sir, you ask me -- you ask me
19 specific questions of a specific photo and a
20 specific black mark on the carpet, and you
21 said, doesn't that -- and we can go back and
22 -- and replay the testimony, but -- but --
23 and the questions.

24 You said, doesn't that prove
25 that that cell caused that char on that

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1 carpet, and I said, no, it does not in that
2 photo for that cell. Obviously --

3 Q. What was the -- what was the
4 difference in -- in the rate of cooling of
5 the two cells that ejected all their
6 contents, such that one wasn't sufficient to
7 char the carpet, but the other one was
8 sufficient to melt the handle of the bag?

9 A. Sir, I, you know, there -- there
10 -- there could be a number of explanations.
11 One could be that the -- that the -- that
12 the initiating cell, the first cell to go
13 off -- because it was -- it's welded and
14 attached to the -- its -- its -- its sister
15 cell, which is in parallel to it, carried
16 them both out, and then at some point,
17 shortly after that, the other cell had a
18 thermal event, and it could have actually
19 had a thermal event after it was ejected
20 from the -- from the battery pack, you know,
21 it's, you know, but again, I want to focus
22 on the point that you asked me specific
23 questions of a specific photo and I gave you
24 answers to that.

25 Now, we're looking at a

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1 different cell in a different photo, and
2 yeah. I -- clearly, that cell -- that cell
3 can was hot enough to melt that plastic when
4 it came in contact with it.

5 Q. That's what I was -- I was --
6 okay. So let's take care of your issue.

7 Turn to Tab 12 and Page 15 and
8 Figure 21, and that was the picture of the
9 carpet with the -- what you say is not char
10 from the cell?

11 A. Right.

12 Q. That's the one. And I believe
13 your testimony was that it couldn't be
14 charred, because by the time the cell
15 reached the ground from the computer, it
16 would not be hot enough to melt the carpet,
17 and if it was that hot, there would be some
18 evidence of carpet melt on the cell?

19 A. Correct.

20 Q. But that's what you said. All
21 right. So then we're looking at your
22 report, and the other cell that ejected its
23 content was apparently hot enough to melt
24 the substance that you show in Figure 17?

25 A. Yeah -- yes.

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1 Q. And I think now you're saying
2 that it's possible that the cell that melted
3 the -- the bag handle in Figure 17 may have
4 ejected its contents after it left the
5 computer?

6 A. It's -- it's possible, yes.

7 Q. Okay. What is the support that
8 you have for that occurring? In other
9 words, is there any physical evidence of
10 that?

11 A. Sir, you're --

12 Q. I'm just asking. Is there any
13 physical evidence of that happening?

14 A. You're -- you were asking me to
15 explain why one cell may have been -- one
16 cell can may have been hot enough to melt
17 polymer. Whereas, the other cell can was
18 not. There could be a couple different
19 explanations.

20 One, the polymer that one cell
21 was in contact with had a lower melting
22 point than the other cell. Another
23 explanation is that they -- and, you know,
24 ejected their contents at different points
25 during the fire, right? So one cell may

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1 have, you know, ejected its contents while
2 it was in the computer carrying the other
3 cell out, which then, you know, ejected its
4 contents, you know, shortly thereafter and
5 still -- and still contained, you know, a
6 significant heat load to be able to melt
7 the, you know, melt the polymer.

8 Q. Could you turn to Page 34 of
9 your report?

10 A. Got it.

11 Q. This is in your "Timing of
12 Events" section, and you say, in my
13 experience, thermal runaway of an 18650
14 battery cell completes in seconds once it
15 has started.

16 Did I read that correctly?

17 A. Yes.

18 Q. All right. So let's -- let's
19 talk about -- first of all, using the
20 Sorensen phase discussion, are you -- are
21 you starting your timing from when the
22 thermal runaway reaction begins creating its
23 own heat or are you talking about the point
24 that it gets to around 200 degrees Celsius
25 when you talk about it occurring in a -- in

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1 seconds?

2 A. The transition from Stage 2 to
3 Stage 1, which typically occurs above 180
4 degrees Celsius. It's --

5 Q. That -- you're saying that --
6 I'm sorry --

7 A. Yeah --

8 Q. Okay. Go ahead, my question --

9 A. The analogy I was going to give,
10 again, is -- is -- is a match, right? So
11 you can heat a match up from an external
12 source, but once the match -- it -- the tip
13 of the match actually ignites, that's kind
14 of like the thermal runaway event, right?

15 So that's -- that's when the
16 chemistry actually goes into that Stage 3
17 where the cathode decomposes, produces
18 oxygen, reacts with the electrolyte, and
19 things go very, very quickly at that point.
20 So it's the -- it's that transition point,
21 Stage 2 to Stage 3, where things go within
22 -- within seconds. Typically, it's done
23 within ten seconds after it starts.

24 Q. So that's what I'm getting at.
25 Okay. So what you're saying in this

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1 statement is, in my -- quote, in my
2 experience, thermal runaway of an 18650
3 battery cell completes in seconds once it
4 has started, and what you're saying is
5 that's when it gets to the point from --
6 from the point it gets to 200 degrees
7 Celsius, approximately, or 190 and it has
8 the -- it starts to accelerate in its rate
9 of heat production at a high rate?

10 That's what takes seconds,
11 you're saying?

12 A. Correct.

13 Q. Not -- not from the point where
14 the thermal runaway reaction actually begins
15 in Phase 2, where it begins to generate its
16 own heat?

17 A. Most people would not call Stage
18 2 thermal runaway --

19 Q. Okay.

20 A. That -- that -- that do any kind
21 of battery failure analysis.

22 Q. Okay.

23 A. The -- the thermal runaway is
24 generally understood at the point where
25 we're above typically for a fully-charged

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1 lithium ion cell above the decomposition
2 temperature in the melting point of --
3 decomposition temperature of the positive of
4 electrode cathode material at the point
5 where it begins to release oxygen and react
6 with the electrolyte. That's where the
7 chemistry generates the vast amount of its
8 heat and it happens very, very quickly.

9 Q. So when you say "in seconds,"
10 are we talking about five seconds, ten
11 seconds? What's the range from that point
12 to when all of the cell contents are
13 expelled, time-wise?

14 A. Assuming that the contents of
15 the cell stay in the cell, less -- ten
16 seconds or less.

17 Q. Well, in this case, for two of
18 them, the contents didn't stay in the cell,
19 right? So you're saying that once they --
20 once it starts ejecting material from the
21 cell, that happens -- that completes in
22 seconds?

23 A. You're -- you're talking about
24 when the cell expels its contents as per
25 Cells 5 and 6 here, where we have a crimp

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1 release and the cells expelled their
2 contents into the room?

3 Q. Right. How -- how -- is that
4 not what you're referring to or you're
5 referring to something else in this
6 sentence?

7 A. I -- I'm referring to a
8 situation where the cell remains intact.

9 Q. Okay. But let me -- let me --
10 before you go on to a long explanation, the
11 whole point you're making here is, you're
12 trying to time when the thermal runaway
13 reaction happened that Ms. Marcellin saw,
14 correct?

15 That's what you're doing here.
16 You're saying that if she saw the reaction,
17 that must have been when the thermal runaway
18 was going on, because if it happened sooner,
19 it would have been over by the time she got
20 in the room; do you recall that was your
21 premise?

22 A. So just wait a second. Allow me
23 to make sure that I answer your -- your
24 question accurately. Yeah. So yes.

25 I mean, that -- that -- I mean,

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1 if she saw projectiles coming from the
2 computer, she -- she was observing cells
3 going into thermal runaway and ejecting
4 their contents.

5 Q. Okay. So that's why I asked you
6 to look at that, because you started to tell
7 me about what would happen if it didn't
8 excel -- eject its contents, and that wasn't
9 what you made the statement for.

10 So now, I'm going to go back to
11 -- my question was: What is your basis of
12 -- and range of time that you say from the
13 beginning of expelling its contents to when
14 all the contents are expelled, what is the
15 range of seconds that that takes?

16 In other words, does it happen
17 all at once, does it happen in parts? What
18 is your -- what is your opinion on that and
19 what is the basis of that opinion?

20 A. When you -- and when you say
21 "expel contents," you're referring to either
22 a crimp release or rupture of the cell?

23 Q. I'm referring to what you -- you
24 have taken from Ms. Marcellin's testimony of
25 what she observed. You -- you took her

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1 testimony and then you said, I interpret her
2 testimony to be X, and based upon X, that
3 happens in seconds.

4 So I don't know what you're
5 talking about. You're the one that made the
6 statement. I'm trying to get a sense of how
7 many seconds it would take from when --
8 presumably, the reason you quote
9 Ms. Marcellin's testimony is because she saw
10 projectiles, correct?

11 A. Correct.

12 Q. And you assume those projectiles
13 came from Cells 5 and 6 or potentially from
14 the other cells that were still in the --
15 that exploded in the computer?

16 A. Based on the fact that she said
17 that projectiles were coming from the
18 computer, the only source of projectiles
19 coming from the computer would have been the
20 lithium ion cells, correct.

21 Q. Right. But which ones?

22 A. I -- I -- I -- I don't know
23 which -- which cells she observed coming,
24 you know, projectiles coming from the
25 computer.

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1 Q. Okay. So there are four
2 possibilities, right?

3 A. There are four possibilities,
4 yes.

5 Q. Okay. And two of those
6 possibilities remained in the computer, and
7 two of those possibilities -- the -- the
8 cans, at least, were found in the corner of
9 the room?

10 A. They were found in the room,
11 correct.

12 Q. Right. So did you assume that
13 what she saw was from the two in the corner
14 of the room that were the empty cans, or did
15 you assume that when she said she saw
16 projectiles coming from the computer, that
17 it was battery cell contents that were from
18 those cells that remained in the computer
19 that were spewing their contents out through
20 the -- the break in the can, or did you not
21 assume either?

22 A. I -- I -- I did not assume
23 either. All -- all I said -- and let me
24 just read the report that Ms. Marcellin --

25 Q. Go ahead.

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1 A. -- subsequently observed
2 fireballs from the notebook and fire
3 dropping from the ceiling. If this was when
4 the cell thermal runaway events were
5 occurring, then this would have been well
6 after the fire had started.

7 So what I was -- what I was
8 saying is that cells were going into thermal
9 runaway after the fire had started.

10 Q. Right. So I'm asking you, which
11 cells were going into thermal runaway when
12 she walked into the room; if you know?

13 A. I don't know.

14 Q. And what is the basis of your
15 opinion that -- that some of the cells had
16 already gone into thermal runaway and
17 ejected their -- their contents before she
18 saw the cell that was ejecting its contents
19 when she walked into the room?

20 How did you exclude that other
21 cells had already ejected their contents
22 before she watched the contents being
23 ejected from whatever cell was ejecting when
24 she walked into the room?

25 A. I -- I never offer that opinion.

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1 Q. So it's possible then that other
2 cells went into thermal runaway before the
3 cell that she observed?

4 A. From -- from the external heat,
5 that's possible. Yes.

6 Q. Okay. And if that happened,
7 then a fire could have started from the
8 ejectile from those prior -- withdraw that
9 question.

10 So just to pin it down, in what
11 sequence did the four cells that went into
12 thermal runaway go into thermal runaway in
13 your opinion?

14 A. I -- I don't have an opinion on
15 -- on the sequence of events.

16 Q. Do you have an opinion as to
17 whether all four went into thermal runaway
18 simultaneously?

19 A. It would likely have been very,
20 very close, because the external heat would
21 have been heating all of the cells, you
22 know, at a reasonably similar, you know,
23 rate. So most likely, they -- they would
24 have gone -- they would have gone into
25 thermal runaway relatively quickly following

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1 each other. The -- the four cells --

2 Q. Okay.

3 A. -- and except for the two cells
4 that basically got ejected from the pack and
5 did not experience a thermal event.

6 Q. What's the basis of your opinion
7 that all the cells went into thermal runaway
8 because of the external heat source as
9 opposed to heat that was transferred from
10 the first cell that went into thermal
11 runaway in combination with whatever heat
12 they were getting from the internal source?

13 A. Well, again, if it was an
14 internal cell fault --

15 Q. I'm just -- I'm not even talking
16 about the -- I'm not even going there. I'm
17 saying that -- I believe you just said that
18 all four of the -- the battery cells
19 experience the same -- well, actually, all
20 six of the battery cells experience the same
21 external thermal heat, correct?

22 A. Similar, yes. They would have
23 all been in the computer at the same time,
24 yes.

25 Q. And two of them show no signs of

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1 thermal runaway?

2 A. They -- they did not. They were
3 ejected from the pack, yes.

4 Q. Okay. And when did that happen
5 in the sequence of events?

6 A. Before they reached the -- the
7 temperature for thermal runaway of those
8 cells.

9 Q. I know. But did it -- did it
10 happen before the other cells went into
11 thermal runaway or between when some cells
12 went in and some weren't? When did it
13 happen?

14 A. Well, they would of had to have
15 been ejected after the -- at least the first
16 cell had, you know, ejected its contents,
17 right, because they wouldn't have been
18 ejected before that -- they would -- they
19 would not have been ejected from the
20 computer before the -- another -- the first
21 cell went into thermal runaway, right?

22 Something had to eject those
23 cells from the computer in the first place.
24 So clearly, they got ejected after -- at
25 least the first cell or two cells had their

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1 ejection of contents and -- in the battery
2 pack.

3 Q. Okay. And so the force that --
4 that ejected them had to come from an
5 explosion from one of the other cells?

6 A. It -- yes, yes. Again, you
7 know, I don't necessarily like the word
8 "explosion," but yes.

9 Q. Okay. We'll -- we'll use a
10 different word. Something --

11 A. A forceable expulsion of the
12 internal contents of -- of one of the other
13 cells pushed those out of the pack.

14 Q. And not only pushed them out of
15 the pack, but pushed them completely out of
16 the computer, right?

17 A. Correct, yes.

18 Q. Okay. And -- and you don't know
19 whether that happened based on one cell
20 going into thermal runaway or multiple cells
21 going into thermal runaway. You just know
22 that at least one went into thermal runaway
23 that would produce enough energy to shoot
24 those out -- out of the computer?

25 A. Correct.

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1 Q. Okay. And you can't tell me the
2 sequence that the four that went into
3 thermal runaway, like, which one started and
4 which one was the last one?

5 A. I -- I -- I cannot.

6 Q. And you can't tell me over what
7 period of time it took from when the first
8 one went into thermal runaway that the last
9 of the four went into thermal runaway? You
10 can't tell me that period of time?

11 A. I -- I -- I can't, but what --
12 what I would say is that it was probably --
13 when a -- a multicell battery pack is -- is
14 forced into thermal runaway through external
15 heat, typically, from the time that the
16 first cell goes to the last cell goes, is
17 within less than a minute, because the cells
18 are almost already at relatively high
19 temperature.

20 So the progression goes much
21 faster than it would if the cells at room --
22 if the pack's at room temperature and you
23 have a cell that initiates the event in a
24 vent through internal heating without an
25 external heat source.

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1 That takes longer to cascade
2 through the pack. When you have an external
3 heat source that brings the whole pack up to
4 temperature, where the first cell starts to
5 go into thermal runaway, things go much
6 faster.

7 Hey, if -- if -- we can keep
8 going, but I was just going -- get a break
9 if, you know, but -- but, Counselor, if you
10 -- if you want to go -- end -- end a certain
11 line of questioning, I'm happy to stay for
12 that.

13 Q. Yeah. Let me just finish this
14 line and then we'll take a break, and then
15 we'll get a read on the -- the time.

16 If I understand what you said, I
17 just want to make sure I'm clear, the reason
18 you know that the time sequence from when
19 the first cell to the last cell went into
20 thermal runaway was a short time sequence,
21 because of your opinion that this occurred
22 as a result of external heat, and when
23 there's an external heat source that causes
24 it, that's the time sequence that you always
25 see?

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1 A. Correct.

2 Q. So is there anything other than
3 your opinion that these went into external
4 heat source, generated thermal runaway that
5 allows you to say that it was a short time
6 sequence other than your assumption and your
7 opinion that it always happens if that's the
8 cause of the thermal runaway?

9 You understand my question?

10 A. No, I'm sorry. I --

11 Q. Okay.

12 MS. WANEMAKER: Can you rephrase
13 it?

14 Q. Let me go back a step and just
15 say it again.

16 I believe what you told me is
17 that, you know that it was a short time
18 sequence from when the first expulsion of
19 contents happen to when the -- the thermal
20 runaway reaction was over, because, you
21 know, every time, based upon your opinion,
22 when there's an external heat source that
23 causes it, it's a short timeframe?

24 A. Correct.

25 Q. Okay. Other than your knowledge

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1 of the typical timeframe when there's an
2 external heat source, is there any other
3 evidence, information that you can provide
4 that would give us a timeframe of how long
5 it -- it lasted from when the first thermal
6 runaway reaction evidence appeared visually
7 to when it would have been -- run its
8 course, anything other than your assumption
9 of how it happened that you base your
10 opinion on that it would of happened in
11 seconds?

12 A. No, no. I -- I can't think of
13 -- as I sit here today, I can't think of any
14 evidence that would -- that would
15 independently be able to provide a timeline
16 for exactly when each cell went into -- into
17 thermal runaway.

18 Q. Okay. Thank you. We can take a
19 break now, and let's go off the record
20 first.

21 THE VIDEOGRAPHER: The time is
22 4:14 p.m., and we're going off the
23 record.

24 (An off-the-record discussion
25 was held at this time.)

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1 THE VIDEOGRAPHER: The time is
2 4:25 p.m., we're back on the record.

3 Q. Going back to your report,
4 Exhibit 1, Page 35, Dr. Horn.

5 A. Yes.

6 Q. The last paragraph on that page,
7 in about the middle of that paragraph, you
8 say, based upon my review of the scene and
9 lab inspection data, I'm going to stop
10 there, and that would be your review of the
11 photographs of the scene and the reports --
12 the notes that you read from Mr. Gorbett and
13 Mr. Galler, correct?

14 A. That's -- that's correct.

15 Q. Okay. Then you say, it does not
16 appear that any cell or notebook remnants
17 were found in the closet.

18 So there was nothing that you
19 found in Mr. Gorbett's notes that discussed
20 finding the cell remnants in the closet, is
21 that what -- what this would indicate?

22 A. Well, in -- in -- in addition --
23 yeah, that -- that is correct. In -- in
24 addition to the reports issued by
25 Karasinski, as well as -- as Professor

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1 Martin, correct.

2 Q. Well, the reports that were
3 issued by Mr. Karasinski and Dr. Martin
4 predate that date you wrote this report,
5 correct?

6 A. That -- that is correct.

7 Q. So when you said, based upon my
8 review of the scene and lab inspection data,
9 you meant to include their reports as well?

10 A. I -- yes. I mean, basically,
11 everything that I had reviewed, I listed in
12 my materials of reviewed, correct.

13 Q. Okay. So then you say, as such,
14 in other words, based upon the assumption
15 that there were no battery remnants found in
16 the closet, it appears that most, if not
17 all, of the cell ejected was found --
18 ejecta, excuse me, was found in locations in
19 the area of origin that experienced more
20 limited thermal damage, let me just stop you
21 there.

22 Are you referring then to areas
23 of the office away from the closet?

24 A. Correct.

25 Q. Okay. So assuming that nothing

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1 -- no ejecta got to the closet and the areas
2 that ejecta was found that you found in
3 reviewing Mr. Gorbett's notes and
4 Mr. Galler's notes -- I guess it would be
5 Mr. Gorbett's notes, because he was the one
6 that was present, you're assuming that there
7 was no obvious ignition pathway between the
8 notebook cell cans -- or cell ejecta and the
9 closet where a concentration of fuel burning
10 was observed?

11 MS. WANEMAKER: Object to the
12 form.

13 You can answer.

14 A. Yeah. I -- I -- I think it's --
15 again, you know, at the time, you know,
16 writing this report, there -- there was -- I
17 don't -- I'm not aware of anyone who had
18 said that there was any evidence of cell
19 ejecta in the closet. So --

20 Q. So -- and -- and I guess your --
21 your assumption here is that -- let me
22 remove that.

23 You said that you're not a fire
24 expert, right?

25 A. Correct.

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1 Q. So when you say, where a
2 concentration of fuel burning was observed,
3 were you relying on one of the other experts
4 who characterized what they saw in the
5 closet or were you relying on your opinion
6 of what you saw in the closet from the
7 photographs that you looked at and
8 Mr. Gorbett's notes?

9 A. Relying upon what -- what other
10 experts, both Plaintiff's and -- as well as
11 experts for HP have stated in that, I
12 believe, it's everybody's opinion that the
13 area of origin was in the closet. So that's
14 -- that's essentially the basis of -- of
15 what I'm trying to get at in -- in that
16 paragraph.

17 Q. Did you -- did you find any --
18 any opinions of anyone that said the fire
19 started someplace other than the closet?

20 A. Not that I recall.

21 Q. Okay. Was there anything in
22 Mr. Gorbett's notes that suggested the fire
23 came from someplace other than the -- the
24 closet?

25 A. Not that I recall.

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1 Q. And -- and based upon your
2 assumption -- based upon the evidence you
3 had at the time you wrote the report, that
4 there was no cell ejecta in the closet.

5 You say at the end of that
6 paragraph, this provides further support
7 that the subject notebook was exposed to
8 external heat attack as a victim of the
9 fire. Okay.

10 So can you just tell me how you
11 came to that conclusion based upon your
12 understanding that there was no cell ejecta
13 in the closet?

14 A. I -- my understanding is that
15 the fire cause and origin experts on this
16 case on -- on both are -- are in agreement
17 that the area of origin is in the closet,
18 right? So if the area of origin is in the
19 closet and there's no evidence of cell
20 ejecta or any part of the -- the battery
21 from the instant computer at issue in the
22 closet, then that is further support that
23 the -- the battery in the laptop at the time
24 of the incident was a victim of the fire,
25 because it was not in the closet at the

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1 time.

2 So the area of origin -- and if
3 everybody agrees, is the closet, there's no
4 evidence of battery material that could have
5 ignited in the closet there, then the
6 battery in the instant computer must,
7 therefore, have been a victim of the fire.

8 Q. Is the converse of that true if
9 there was battery material found in the
10 closet that that would refute that
11 assumption?

12 A. If there was -- I mean, you
13 know, if there is battery material that is
14 -- would be a competent ignition source,
15 then that's something that I would have to
16 review.

17 Q. Okay. Going onto -- to the next
18 page, where you begin to critique
19 Dr. Martin.

20 You have in the -- in the first
21 full paragraph under Section 5.1, I think
22 this is just a recitation of what you
23 already said, but it says, as discussed in
24 Section 4, analysis of the remains of the
25 battery cells observed at the scene, the

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1 notebook, and the association -- associated
2 -- remnant locations in the alleged room of
3 origin of the fire are more indicative of
4 the subject notebook failing as a result of
5 an external heat attack from a fire already
6 in progress.

7 Did I read that correctly?

8 A. Yes.

9 Q. And I think we've been through
10 this, so is your opinion that all those
11 things support your theory of external heat
12 attack, it's based on multiple things you
13 list here, and one of them is the location
14 of the cells -- of the -- of the -- the cans
15 and the remnants in the room, right?

16 A. Yes.

17 Q. And is that -- is that based
18 upon your prior testimony that -- your
19 opinion that it's highly unlikely that if it
20 wasn't an external heat source that caused
21 it, there would be no ejection of the
22 battery contents?

23 A. Correct.

24 Q. Okay. I just want to make sure
25 I understood that, and then with regard --

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1 when you say "the notebook," are you talking
2 about your testimony regarding your
3 interpretation of the deformities of the
4 laptop itself?

5 MS. WANEMAKER: Objection to the
6 form.

7 A. I, you know, not -- not in that
8 particular sense. I -- I think that I'm
9 using the -- the term in that particular
10 sense, "subject notebook" more -- more or
11 less referring to the subject battery in the
12 notebook.

13 Q. Okay. Just so I'm clear, the
14 sentence we're on is the one you say, as
15 discussed in Section 4, analysis of the
16 remains of the battery cells observed at the
17 scene, then you say "the notebook," and I
18 just wanted to just drill down on what you
19 meant by "the notebook" there.

20 A. Yes. So the subject notebook
21 battery pack would have been more complete.

22 Q. So the -- the battery pack
23 meaning, what the -- the cells and the
24 remnants of that?

25 A. Correct.

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1 Q. And I -- I neglected to ask you
2 this: Did you do any analysis of the
3 capability of the battery management system
4 of the battery pack that was in the computer
5 at the time of the event?

6 A. I have -- I have not done any
7 analysis other than to review Galler's notes
8 and -- and -- and his report on, you know,
9 the -- on the battery pack itself.

10 Q. Okay. So any conclusions or --
11 or any assumptions you made regarding the
12 capability of that battery pack to provide
13 protection against thermal runaway would be
14 based upon Mr. Galler's assessment?

15 A. It -- I would say that in -- in
16 -- yes, except for the fact that -- I mean,
17 I did review the photos and I agree that
18 there is no -- that there was not evidence
19 of independent block voltage monitoring, as
20 well as thermal monitoring of -- of the
21 battery pack. That, you know, I -- I
22 reviewed what he -- he did, and I was -- I
23 agreed with that, so --

24 Q. So the -- the battery pack
25 specifications from HP required a thermistor

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1 that would monitor temperature of the
2 battery pack, and you confronted there was
3 no thermistor on this -- this board?

4 A. Based on my analysis of the
5 photos that it did not appear that there was
6 a thermistor in the battery pack, correct.

7 Q. Okay. And other than that then
8 in -- in your observation that you made of
9 the photographs versus -- you didn't do any
10 research into the particular gas gauge that
11 was on that board and whether or not the --
12 the components of that gas gauge that would
13 be -- that would control things like cell
14 balance, and overcharging, and undercharge,
15 and over-temperature, you didn't do any
16 analysis as to whether any of that was
17 functional on that board?

18 A. Well, with -- with -- I would
19 say that, you know, with the exception of
20 the fact that I did not see any evidence of
21 individual block voltage monitoring, which
22 would be required if you were going to be
23 doing things like block balancing, or, you
24 know, individual block overcharge,
25 overdischarge protection.

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1 Q. Just help me understand what
2 "individual block" means.

3 A. So recall that the -- we
4 referred to this battery -- this six-cell
5 battery pack as a 3S2P, right? So we've
6 got, you know, three blocks of cells in
7 series. Each block has two cells, right?

8 So the -- the -- each parallel
9 block is -- is -- isn't parallel, so it's
10 going to be at the same voltage and in order
11 to have pack balancing or cell balancing,
12 you have to monitor the voltage of each
13 individual block, and there didn't appear to
14 be evidence that that was -- that was, you
15 know, that was being utilized on this pack.

16 Q. So the cell balancing feature is
17 actually a two-cell balancing feature, where
18 it would -- you would have a -- a -- a
19 monitor of the voltage in each of the -- the
20 blocks, which are two cells?

21 A. Of each of the blocks. Not each
22 individual cell within a block, but with --
23 on each of the blocks.

24 Q. And what you could tell just
25 from looking at the photos is that there

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1 were no such voltage monitors that were
2 apparent that would have been able to do
3 that for this particular battery pack?

4 A. That's correct, I did not see
5 that.

6 Q. And then in the next paragraph,
7 you say, Dr. Martin alleges a specific
8 failure mode of a battery pack without
9 identifying the initiating cells. That's
10 the first thing you say, right?

11 A. Yes.

12 Q. Were you able to identify the
13 initiating cell that started the thermal
14 runaway reaction?

15 A. Well, other than it would have
16 -- I mean, the -- the first cell to go into
17 thermal runaway, no.

18 Q. Right. I don't know what --
19 what initiating cell means to you, but
20 that's what it would mean to me.

21 A. So -- so -- when -- so, you
22 know, Professor Martin, you know, says that,
23 you know, a -- a -- a -- one of the cells in
24 the pack initiated the -- the entire event.

25 So generally, one would want to

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1 identify if -- if that is his assumption,
2 that's his theory, is that, you know,
3 there's no fire and everything is fine in
4 the room, and then for some reason, you
5 know, a cell goes bad inside the computer
6 and initiates the event.

7 Normally, one would have to
8 identify the initiating cell and talk about
9 how then the event progresses from there and
10 show evidence that that initiating -- that
11 that initiating -- that that cell initiated
12 from some -- for some reason, whether it's
13 an internal cell defect, a manufacturing
14 problem, you know, whether it's because of,
15 you know, lack of pack balancing, or block
16 balancing, or, you know, whatever it is that
17 you have -- you identified what the
18 initiating cell is.

19 My point here is that Professor
20 Martin did not identify an initiating cell.

21 Q. Okay. So you -- you say that
22 that should have been done by having any
23 mass measurements, and I assume that would
24 mean a determination of the -- the loss of
25 mass of a cell?

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1 A. Loss of mass of a -- of a cell,
2 or the collection of materials that were
3 ejected from the cell, or it, you know,
4 there, you know, anything that would -- I
5 mean, there was -- there was no analysis
6 from Professor Martin and he is the one that
7 is asserting and he has the burden of proof
8 to -- to, you know, to show that, you know,
9 his -- his hypothesis that a -- a cell
10 initiated the -- the event from the pack,
11 but he didn't do any analysis to -- to
12 confirm, you know, or -- or to show how the
13 evidence supported that --

14 Q. Okay. I just want to -- I want
15 to try to take this in pieces, and I know
16 there's more -- there's more to it, but I
17 want to ask you, again, the mass measurement
18 question.

19 Tell me -- tell me what analysis
20 could have been done on these empty cells
21 and the ruptured cells, and the -- the
22 pieces of battery that were -- the internal
23 battery components that were found, what
24 could have been done that would have been
25 able to determine one way or the other the

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1 initiating cell?

2 A. Well, I, you know, one of the
3 things that one would do is to try to assert
4 -- try to determine what the state of charge
5 of the cell is, and, you know, so
6 identifying any remnant of -- of un-reacted
7 active materials from the cells, you know,
8 doing x-ray diffraction on -- on --

9 Q. So wait, wait, wait --

10 A. -- material --

11 Q. Okay. Let me stop you there,
12 I'm sorry. The x-rays are not going to tell
13 you state of charge; are they or are they?

14 A. X-ray diffraction can give you
15 some indication of what the state of charge
16 is, and then also mass analysis of the cells
17 that did not go into thermal runaway, may
18 give you an indication of what the state of
19 charge of those, and, you know, you can also
20 do analysis of the remains of the active
21 materials, and there -- there are other
22 things that one can do to try to, you know,
23 you know, provide you with experimental
24 evidence of, you know, if you are thinking,
25 you know, asserting, you know, this is due

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1 to overcharge, or overdischarge, or whatever
2 the -- the assertion is that would cause a
3 cell to have a thermal event, you know, one
4 could take, you know, give exemplar cells in
5 attempt to overcharge them and try to
6 replicate, you know, these -- these types of
7 things. One could get an exemplar --

8 Q. Let me just stop you. If you
9 got cells to try to replicate thermal
10 runaway by overcharging them, how would that
11 help you identify which cell was the
12 initiating cell in this scenario? How
13 would -- how would that happen?

14 A. Yeah. So you would -- you would
15 attempt to replicate the, you know, the --
16 the -- the conditions that -- that are --
17 that he has asserted, which is, you know,
18 something wrong with the battery pack
19 management system, you know, that is not
20 controlling overcharge or overdischarge, and
21 show that if that is indeed, you know, the
22 case, then -- then you would have cells
23 rupture, or expel contents, or -- or things
24 like that with -- with -- with this battery
25 pack, and, you know, I mean, again, you

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1 know, you know, Professor Martin is -- is
2 the one that is asserting these things,
3 and --

4 Q. Yeah. I'm just trying to drill
5 down to understand how if you got another
6 battery pack -- first of all, this was a --
7 a counterfeit battery pack that no one knows
8 where it came from, so that's the first
9 question.

10 How would you get an exemplar
11 counterfeit battery pack that looks
12 identical to this and know what state of
13 charge to -- to put that exemplar battery
14 pack into to do the experiment that you say
15 would help you determine which was the
16 initiating cell? How would you do all that?

17 A. Well, first, it's not a
18 counterfeit pack. I -- we got to get the
19 nomenclature correct.

20 Q. Well, I thought it -- my
21 understanding -- maybe you have a different
22 understanding, it said "HP" on the outside
23 and it wasn't an HP authorized battery pack.
24 I would -- I would call that a counterfeit,
25 but if you say that there's some other term

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1 for it, go ahead.

2 A. I don't recall it saying that it
3 wasn't -- that the -- I mean, counterfeit is
4 -- is one -- is -- is -- is a pack that is
5 selling itself as a genuine HP product as
6 opposed to an aftermarket or non-OME pack.

7 Q. And -- and you didn't find
8 markings on this -- the remnants of the
9 battery pack that indicated it was an HP
10 battery pack, is that what you're saying,
11 you didn't see that?

12 A. I -- I seem to recall there may
13 be an HP model number, but nothing that
14 would imply that it was a genuine HP battery
15 pack.

16 Q. Okay. So for a consumer who
17 sees an HP model number on it, is that
18 something that you would expect them to
19 immediately say, that can't be an HP battery
20 pack?

21 MS. WANEMAKER: Object to the
22 form.

23 You can answer.

24 A. I mean, you know, I -- it
25 doesn't have the same markings as the pack

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1 that came out of the -- that they're
2 replacing, so --

3 Q. Right. But -- but I'm saying
4 that, are you -- is it your expectation that
5 a consumer would be able to discern one
6 battery pack that says "HP" from another
7 battery pack that says "HP" that maybe was
8 manufactured at a different point in time
9 and say, these labels are not identical,
10 therefore, this must be a counterfeit?

11 MS. WANEMAKER: Objection to the
12 form.

13 You can answer.

14 A. Yeah. I would -- I would think
15 that that's -- yes, I would say --

16 Q. You think most people should
17 be --

18 A. But I'm not -- I'm not an expert
19 in -- in -- in that. That's a good question
20 for Joe Sala, Dr. Sala, who is our human
21 factors individual who is a part of this
22 case. So --

23 Q. Okay.

24 A. It's a bit outside my --

25 Q. So let's -- let's get back to

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1 the -- you're saying that -- that a mass
2 measurement was not done, and I'm still
3 trying to understand that. So two cells had
4 -- had completely lost their contents and
5 two cells were ruptured and had lost their
6 contents.

7 So what would the mass
8 measurement compare? In other words, what
9 would you do to say, this -- this empty cell
10 is more likely to be the initiating cell
11 than this empty cell, because I found X?
12 What is it that you -- you think you could
13 find that would tell you which was the
14 initiating battery cell?

15 A. Again, it isn't just one test,
16 but --

17 Q. No, I know it's not. I know
18 it's not, but you said mass measurement. So
19 I want to take it one at a time, and then
20 you can tell me how each of them is relevant
21 to -- to proving that point, and this is the
22 one we're talking about.

23 So it's mass measurement, how
24 would -- how would you do a mass measurement
25 analysis to determine which was the

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1 initiating cell? That's the question. I
2 know there's other tests, but this is the
3 test you specified here.

4 So I just want you to explain
5 why this test would tell you that or give
6 you some -- some information for that.

7 A. So mass measurement on the cells
8 that did not have a thermal event would give
9 you an indication whether or not those cells
10 actually vented or not, and that would give
11 you an indication of how hot those cells
12 got.

13 Did they get to the point where
14 they would vent or did they not get to that
15 point. So that's -- that's -- and -- and
16 also a measure -- that would also give you a
17 measurement on whether, you know, whether
18 they vented and whether the CID activated or
19 not.

20 So that's just -- again, it's
21 just a data point in that analysis, but it's
22 -- if you're -- if you're going to blame the
23 battery pack, then you need to go through
24 and you need to -- dot your I's and cross
25 your T's and go through the entire analysis

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1 of every -- of what -- of the evidence that
2 you have.

3 Q. Okay. So what you just said
4 then is that the mass measurement you would
5 do is not of the cells that ruptured or that
6 ejected all their contents, but the cells
7 that were intact?

8 A. Correct.

9 Q. And if you studied the cells
10 that were intact, you could also tell the
11 likelihood that it was an external thermal
12 attack, right? That would be something that
13 would give you evidence of an external
14 thermal attack by studying those cells?

15 A. It may, yes.

16 Q. And Mr. Galler was at the
17 laboratory examination. Did he request that
18 those cells be studied that way so he could
19 make a determination as to whether this was
20 an internal failure of the other cells or
21 there was some support for your theory that
22 it was an external heat attack?

23 MS. WANEMAKER: Object to the
24 form.

25 You can answer.

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1 A. Yeah. Counselor, you -- you --
2 you are under -- you do realize that -- that
3 Mr. Galler was at the inspection over a year
4 before I was involved with -- with this
5 case, right? So I don't -- I don't know if
6 he -- that's a question for him, right,
7 whether he requested that or not.

8 Q. But the -- had an analysis like
9 that been done, would that have provided you
10 with more information about whether your
11 theory is correct?

12 A. From my perspective, no. It
13 would not have provided me with -- with --
14 with -- with additional information. If I
15 was Professor Martin and I was the one
16 accusing this battery pack of -- of
17 initiating this event, then I would want to
18 use every tool of my disposal in order to
19 analyze everything that -- that I had, that
20 -- that was available to me, but from my
21 perspective, the evidence is very, very
22 conclusive that it was external heat attack.

23 Q. So the -- the two intact battery
24 cells would -- would have definitive
25 evidence of how much heat they were exposed

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1 to if you looked at them, correct?

2 A. I wouldn't necessarily say that
3 they would have definitive evidence, but
4 there -- there may be -- there -- there may
5 be some information gleaned from -- from --
6 from that.

7 Q. And -- and the information that
8 could be gleaned would be if it was an
9 external fire attack, how much heat were
10 these cells exposed to from that source?

11 A. Possibly. Again -- again, we
12 don't want to take any -- any specific
13 information or -- or test in a vacuum. It's
14 just wanting to collect as -- if -- if -- if
15 you're -- if you are accusing a battery pack
16 of initiating a thermal event, you want to
17 take the time to do as much as you can on
18 the evidence that -- that you have.
19 Especially when the evidence that has been
20 collected is contrary to the battery pack
21 initiating the event.

22 Q. So let me just ask you this
23 question: Is it your opinion that studying
24 the two intact battery cells would have
25 proved more information to -- to determine

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1 what caused the other cells to go into
2 thermal runaway, then it would have to
3 determine whether these cells were actually
4 exposed to enough external heat to cause
5 damage to the cells?

6 A. No. I -- I -- I -- I don't
7 think so, but if I was the person that was
8 blaming the cells, then I would certainly be
9 wanting to do as much as I could.

10 Q. Okay. And as much as you could
11 would be included -- would be looking at the
12 actual cell components themselves, right,
13 not just pictures?

14 A. No. From -- I, you know, again,
15 if -- if -- if you're -- if you're
16 attempting to blame the battery pack,
17 then -- and you have the burden of proof on
18 -- on that, then you need -- then -- then
19 you need to have evidence that the battery
20 pack actually did initiate the event.

21 So therefore, looking at the
22 evidence to try to prove a hypothesis is
23 something that one would want to -- want to
24 do. Especially when all of the evidence is
25 contrary to your opinion.

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1 Q. So in your opinion then, the
2 role of the expert -- an expert that says it
3 was the battery pack that caused the fire or
4 caused the thermal runaway, has to do more
5 than the -- than the expert who says it was
6 from an external fire attack, because the
7 plaintiff has the burden of proof, is that
8 where you're going with this?

9 MS. WANEMAKER: Object to the
10 form.

11 A. All I'm saying is that -- that
12 if -- if you're going to try -- if you have
13 a hypothesis that -- and it's contrary to
14 all of the existing evidence, than you have
15 to go above and beyond to prove that
16 hypothesis.

17 Q. Now, the -- the hypothesis --
18 the final hypothesis of the initial fire
19 investigation from Allegany was that in
20 fact, it was the laptop that started the
21 fire, correct?

22 A. You're referring to the -- the
23 fire department?

24 Q. Yes.

25 A. Yeah. That -- that -- that's my

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1 understanding.

2 Q. Okay. So -- so Dr. Martin
3 didn't come up with that hypothesis, the --
4 the initial fire investigators came up with
5 that hypothesis, correct?

6 A. The initial fire investigator
7 that is not a battery expert came up with
8 that hypothesis, correct.

9 Q. And you don't know what
10 hypothesis Mr. Gorbett came up with, do you?

11 A. No. Off the top of my head, I
12 don't.

13 Q. Okay. Do you think you received
14 that and you just forgot about it?

15 A. No. I don't think that I ever
16 -- I ever did.

17 Q. You said that there was nothing
18 in Mr. Karasinski's report, his initial
19 report, that indicated that a fragment from
20 the battery that was ejected from the
21 battery ignited the combustibles in the
22 closet; do you recall that?

23 A. Yes.

24 Q. All right. Take a look at your
25 report, Page 38 and Section 6.1.

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1 A. Okay.

2 Q. You pulled from Mr. Karasinski's
3 first report, correct, that's what you have
4 here?

5 A. Correct.

6 Q. I think you forgot to put the
7 end of the quotes, but I assume it's
8 everything after "based"?

9 A. I'm -- I'm -- I'm sorry, what --
10 what --

11 Q. In the heading, you have an --
12 an open quote before the word "based," but
13 you don't have a -- close the quotation.
14 I'm just saying, I'm assuming that the --
15 the entire part that's in bold there is a
16 quote.

17 A. Yes. My -- thank you. I'm
18 going to -- I'll -- I'll -- I'll chastise my
19 -- the person who did the editorial on -- on
20 that. So yes --

21 Q. I'm not -- I'm not --

22 A. It should have been -- it should
23 have been a close quote. I --

24 Q. Okay. Just -- just want to --
25 to make sure that we're quoting it. So you

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1 say quote -- and this is from
2 Mr. Karasinski's initial report, based on
3 the totality of the investigation, the cause
4 of the fire was a failure of the HP Pavilion
5 Notebook to include the battery pack.

6 This failure resulted in the
7 ejection of hot battery material that
8 ignited combustibles located within the room
9 of origin to include the closet. So he
10 actually did provide that opinion in his
11 first -- in his first report. He just
12 didn't provide a picture of the ejected
13 piece that was in the closet, right?

14 A. He provided an opinion with no
15 evidence to support it, correct.

16 Q. So -- but -- but he -- he said
17 that it was an ejected piece of battery
18 material in the closet that caused the fire
19 in the first report, that's what he said.

20 A. That's what he said, but at the
21 -- when he wrote that report and there was,
22 you know, the evidence was collected and
23 analyzed at the October 2020 inspection,
24 there was no piece of evidence that was --
25 that had -- that was analyzed and identified

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1 as being pulled from the closet.

2 Q. So let me just break that one
3 down. Would there be some analysis that you
4 would do that -- other than asking the
5 witnesses that were there to determine where
6 the fragment came from?

7 A. Well, one would start with doing
8 a competent analysis similar to what was
9 done on the fragments that were recovered
10 from the office area, right?

11 One would expect that, you know,
12 one would take photos with -- with scale
13 bars, you know, and -- and do at least some
14 kind of photo documentation of the actual
15 evidence, not just some blurry photo of the
16 of -- of -- of a, you know, a piece of
17 material in the debris that was, you know,
18 shoveled out of the closet.

19 I would think that that would be
20 a great place to start. Just do -- do what
21 you did on the other evidence. That wasn't
22 done --

23 Q. Okay. Well, you don't know what
24 was done, because you weren't there, right?

25 A. Counselor, there is -- there is

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1 -- there is no documentation from that
2 inspection that I certainly have seen that
3 would indicate that that piece of debris
4 that Mr. Karasinski identifies in his
5 rebuttal report was analyzed at the 2000 --
6 October 2020 inspection.

7 Q. Okay. So that -- that's a
8 different question, and that's what I was
9 going to ask you. So is there some analysis
10 that you could do in a laboratory in October
11 that would have told you something about
12 where that fragment was found?

13 A. Where the fragment was --

14 Q. Well, you said that the location
15 of the fragment in the closet is the key
16 factor, and you said that it should have
17 been done in October at the -- at the lab
18 investigation.

19 So I'm trying to say, how did
20 you -- what was your methodology at the
21 laboratory that would have provided
22 additional evidence about where that
23 fragment came from?

24 MS. WANEMAKER: Objection to the
25 form.

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1 A. Well, first and foremost, one
2 has to identify and make sure that it
3 actually is a fragment from a battery cell.

4 To my knowledge, that has not
5 been done, and then secondly, one would have
6 to analyze that fragment to determine that
7 it actually came from one of the cells that,
8 you know, one of the instant battery cells
9 and not some other component that may have
10 already been in the closet itself.

11 Q. What -- what other components
12 were in the closet to your knowledge that
13 could have produced that fragment?

14 A. My understanding is that there
15 were other electronic components in the
16 closet that may or may not have -- have had
17 batteries in there. I mean, that's --

18 Q. Okay --

19 A. So --

20 Q. Which ones?

21 A. I -- I -- I don't know. There
22 were other things in the closet.

23 Q. I know. But which ones were --
24 were devices that would of had a copper
25 winding from an internal battery -- lithium

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1 ion battery cell?

2 A. Nobody has identified that as
3 being a copper winding from a lithium ion
4 battery cell, number one. That's --
5 that's --

6 Q. That's in your opinion, I guess.
7 Okay. Let's move on.

8 A. It's not just my opinion. I
9 have not seen anything -- I have not seen
10 anything, you know, correct -- it's not in
11 Karasinski's report. A blurried [sic]
12 picture of a piece of fragment on -- on --
13 on -- in a bunch of debris on the floor,
14 does not say that that is a piece of copper
15 winding from a lithium ion battery, and it
16 certainly does not say that it is a piece of
17 copper winding from a battery that was from
18 the instant computer.

19 Q. Okay. You've -- you've made
20 your point, thank you. All right. Then you
21 have -- then the last sentence, you say, it
22 appears that in the absence of a -- of a --
23 of an observed ignition source that would be
24 consistent with the fire damage patterns
25 observed in the room, Mr. Karasinski has

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1 attributed the initiation of the fire to the
2 notebook without sufficient evidentiary
3 proof to support that claim; do you see
4 that?

5 A. Yes.

6 Q. So if I understand what you're
7 saying, because you don't think a fragment
8 from a battery cell was found in the closet,
9 you think Mr. Karasinski has not supported
10 his theory of the ignition of the -- the
11 clothing and linens in the closet, he has
12 not supported that -- that theory, is that
13 what you're saying here?

14 A. Yes.

15 Q. And if he had found a cell
16 fragment that you believe was actually from
17 the -- one of the battery cells, then that
18 would be proof, but he hasn't found that?

19 A. No. I'm not saying that it
20 would be proof, because we still have all of
21 the evidence of the damage patterns of the
22 batteries that are inconsistent with an
23 internal fault in a battery as described by
24 Professor Martin. So there's all the other
25 body of evidence in addition to that.

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1 Again, this is just pointing out
2 that you have -- you have an area of origin
3 in the closet that -- that the fire
4 investigators continue to point to with no
5 competent ignition source.

6 Now, I will defer to the fire
7 cause and origin guys on -- on that, but
8 from my perspective, you know, there --
9 there has not been -- has not been shown
10 that there is any evidence of battery debris
11 from the instant computer in the closet.
12 That has not been shown.

13 Q. But if it had been shown, that
14 wouldn't convince you that it was from the
15 laptop anyway, correct?

16 MS. WANEMAKER: Form.

17 You can answer if you can.

18 A. Well, first and foremost, you --
19 one would have to show that the debris is
20 from a lithium ion cell.

21 Q. Okay. So assume that -- that
22 that was shown, that that was debris from a
23 lithium ion cell, then that wouldn't change
24 your opinion either, because you believe
25 that the only way that ejected material can

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1 come out of a battery cell is from external
2 heat source.

3 So that would be just an
4 incidental finding to you even if it weren't
5 true?

6 MS. WANEMAKER: Form.

7 You can answer.

8 A. Correct.

9 Q. Okay. And -- and that opinion
10 is -- is basically uninformed by any
11 information you have as to what could have
12 possibly started a fire that provided the
13 external heat source, correct?

14 A. Yeah. I -- I -- I -- I think --
15 I want to make sure that -- what you're
16 saying is that I do not personally have a --
17 a -- an alternative -- an alternative
18 ignition source in the closet. Is that --
19 is that what you're asking?

20 Q. I'm asking that, either in the
21 closet or anywhere else in the house.

22 A. Yeah. Then -- then I -- I
23 believe that I answered in the affirmative
24 in that I do not have an alterative for the
25 -- for the initiation of the -- the event.

Horn - direct

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1 Q. But for your theory to be true,
2 your opinion to be accurate, there would
3 have to be an external heat source that was
4 capable of heating the -- the computer
5 before the cells went into thermal runaway?

6 A. Correct. Another way of saying
7 it is, something started the fire and that
8 has not been, to my knowledge, identified.

9 Q. So without something starting a
10 fire, your theory couldn't be true? In
11 other words, the cells didn't go into
12 thermal runaway by themselves, they were
13 forced into thermal runaway in your view by
14 an external fire that caused them to heat
15 up, right?

16 A. Correct.

17 Q. So if your theory is true, then
18 there must be some evidence of an external
19 fire starting somewhere else that one of the
20 other experts has found?

21 MS. WANEMAKER: Objection to the
22 form.

23 A. I -- I -- again, you're --
24 you're -- you're -- we're -- we're straying
25 into fire cause and origin areas, right? My

Horn - direct

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1 understanding of an FP921 is that there are
2 situations where the cause of a fire is
3 undetermined, and simply by eliminating
4 other sources of a fire if you do not have
5 evidence that something caused the fire,
6 that you can -- that the fire is still
7 undetermined.

8 So there are situations where
9 the cause of the fire is undetermined. So,
10 but again, you know, fire cause and origin
11 question.

12 MR. SCHWARZ: Can we just take a
13 short break? I think I'm done. About
14 five minutes.

15 MS. WANEMAKER: Sounds good.

16 THE VIDEOGRAPHER: The time is
17 5:08 p.m., and we're going off the
18 record.

19 (An off-the-record discussion
20 was held at this time.)

21 THE VIDEOGRAPHER: The time is
22 5:12 p.m., and we're back on the
23 record.

24 Q. Dr. Horn, I'd -- I'd love to
25 keep talking to you for the rest of the

Horn - direct

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1 afternoon until my seven hours is up, but I
2 think I'm going to let us all have a break
3 and we'll be done. Thank you for your
4 patience with me.

5 A. Thank you, sir. Thank you for
6 your patience with me, I appreciate it.

7 MS. WANEMAKER: Nice to see
8 everyone.

9 THE VIDEOGRAPHER: The time is
10 5:12 p.m., and we're going off the
11 record.

12 (Exhibit 7, Karasinski's Report,
13 was received and marked for
14 identification by the reporter.)

15 (Exhibit 8, Liu Article, was
16 received and marked for identification
17 by the reporter.)

18 (Deposition concluded at
19 5:12 p.m.)
20
21
22
23
24
25

WITNESS CERTIFICATION

I have read the foregoing transcript
of my testimony and find it to be true and
accurate to the best of my knowledge and
belief.

QUINN HORN

Subscribed and sworn to before me on
this ____ day of _____ 2025.

NOTARY PUBLIC

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I N D E X

WITNESS: DIRECT CROSS REDIRECT RECROSS

QUINN HORN

By Mr. Schwarz 5

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Exhibit 10	Methodologies For Battery Failure Analysis	260

INFORMATION AND/OR DOCUMENTS REQUESTED

(none)

QUESTIONS MARKED FOR RULINGS

(none)

(Exhibit(s) attached)

C E R T I F I C A T E

STATE OF NEW YORK)

: SS.:

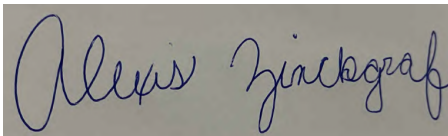
COUNTY OF NEW YORK)

I, ALEXIS ZINCKGRAF, a Court
Reporter and Notary Public, do hereby
certify:

That the witness whose examination
is hereinbefore set forth was duly sworn and
that such examination is a true record of the
testimony given by that witness.

I further certify that I am not
related to any of the parties to this action
by blood or by marriage and that I am in no
way interested in the outcome of this matter.

IN WITNESS WHEREOF, I have hereunto
set my hand this 27th day of April 2025.



ALEXIS N. ZINCKGRAF

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Jaclyn Wanemaker, Esq., Smith Sovik Kendrick & Sugent
wanemaker@smithsovik.com

05/05/2025

RE: Marcellin, Carol v. HP, Inc. And Staples, Inc.
4/3/2025, Quinn Horn (#7232381)

The above-referenced transcript is available for
review.

Within the applicable timeframe, the witness should
read the testimony to verify its accuracy. If there are
any changes, the witness should note those with the
reason, on the attached Errata Sheet.

The witness should sign the Acknowledgment of
Deponent and Errata and return to the deposing attorney.
Copies should be sent to all counsel, and to Veritext at
(plsteno@veritext.com).

Return completed errata within 30 days from
receipt of testimony.

If the witness fails to do so within the time
allotted, the transcript may be used as if signed.

Yours,

Veritext Legal Solutions

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Marcellin, Carol v. HP, Inc. And Staples, Inc.

Quinn Horn (#7232381)

E R R A T A S H E E T

PAGE_____ LINE_____ CHANGE_____

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REASON_____

Quinn Horn

Date

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[absence - agree]

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[agree - anticipate]

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[anybody - asking]

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[asking - back]

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[back - battery]

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